

# **Oliver Hazard Perry Class Frigates 2015**

## **United States Navy Perry Class Frigates**

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# Chapter 1

## Introduction

### 1.1 Oliver Hazard Perry-class frigate

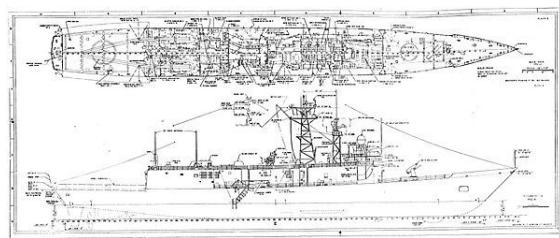
The **Oliver Hazard Perry class** is a class of guided missile frigates named after the American Commodore Oliver Hazard Perry, the hero of the naval Battle of Lake Erie. Also known as the *Perry* or FFG-7 class, the warships were designed in the United States in the mid-1970s as general-purpose escort vessels inexpensive enough to be bought in large quantities to replace World War II-era **destroyers** and complement 1960s-era **Knox**-class frigates. In Admiral Zumwalt's "high low fleet plan", the FFG-7s were the low capability ships with the Spruance destroyers serving as the high capability ships. Intended to protect amphibious landing forces, supply and replenishment groups, and merchant convoys from aircraft and submarines, they also later were part of battleship-centric surface action groups and aircraft carrier battle groups/strike groups.<sup>[1]</sup> Fifty-five ships were built in the United States: 51 for the **United States Navy** and four for the **Royal Australian Navy** (RAN). In addition, eight were built in Taiwan, six in Spain, and two in **Australia** for their navies. Former U.S. Navy warships of this class have been sold or donated to the navies of Bahrain, Egypt, Poland, Pakistan, Taiwan and Turkey.

The U.S. Navy built 51 of the *Oliver Hazard Perry* frigates, with the first going into service in 1977. The last, the **USS Simpson (FFG-56)**<sup>[2]</sup> was decommissioned on Sept. 29, 2015. The retired vessels were either mothballed or transferred to other navies for continued service. Some of the U.S. Navy's frigates, such as **USS Duncan** (14.6 years in service) had fairly short careers, while a few lasted as long as 30+ years in active U.S. service,<sup>[3]</sup><sup>[4]</sup> and some lasting even longer after being sold or donated to other navies.

#### 1.1.1 Design and construction

The ships were designed by the Bath Iron Works shipyard in Maine in partnership with the New York-based naval architects Gibbs & Cox.

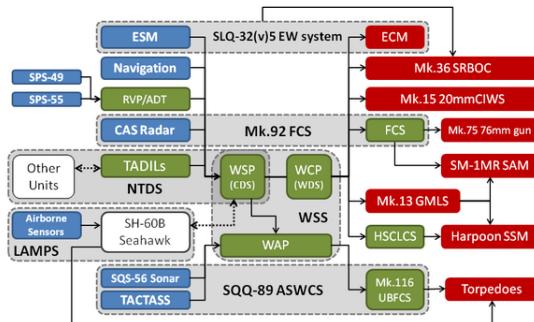
The *Oliver Hazard Perry*-class ships were produced in 445-foot (136 m) long "short-hull" (Flight I) and 453-foot



Outboard profile of the "long-hull" design.

(138 m) long "long-hull" (Flight III) variants. The long-hull ships (FFG 8, 28, 29, 32, 33, and 36-61) carry the larger SH-60 Seahawk LAMPS III helicopters, while the short-hulled warships carry the smaller and less-capable SH-2 Seasprite LAMPS I. Aside from the lengths of their hulls, the principal difference between the versions is the location of the aft **capstan**: on long-hull ships, it sits a step below the level of the flight deck in order to provide clearance for the tail rotor of the longer Seahawk helicopters. The long-hull ships also carry the **RAST** (Recovery Assist Securing and Traversing) system for the Seahawk, a hook, cable, and winch system that can reel in a Seahawk from a hovering flight, expanding the ship's pitch-and-roll range in which flight operations are permitted. The FFG 8, 29, 32, and 33 were built as "short-hull" warships but were later modified into "long-hull" warships. *Oliver Hazard Perry*-class frigates were the second class of surface ship (after the *Spruance*-class **destroyers**) in the US Navy to be built with gas turbine propulsion. The gas turbine propulsion plant was more automated than other Navy propulsion plants at the time and could be centrally monitored and controlled from a remote engineering control center away from the engines. The gas turbine propulsion plants also allowed the ship's speed to be controlled directly from the bridge via a throttle control, a first for the US Navy.

American shipyards constructed *Oliver Hazard Perry*-class ships for the U.S. Navy and the **Royal Australian Navy** (RAN). Early American-built Australian ships were originally built as the "short-hull" version, but they were modified during the 1980s to the "long-hull" design. Shipyards in Australia, Spain, and Taiwan have produced several warships of the "long-hull" design for their navies.



*Scheme of the combat systems of the Oliver Hazard Perry-class frigate.*

Although the per-ship costs rose greatly over the period of production, all 51 ships planned for the U.S. Navy were built. Some *Oliver Hazard Perry*-class warships are planned to remain in American service for years, but some of the older ships have been decommissioned and some scrapped. Others of these decommissioned ships have been transferred to the navies of other countries, including Bahrain, Egypt, Poland, Pakistan, and Turkey. Several of these have replaced old Second World War-built American destroyers that had been given to those countries.

During the design phase of the *Oliver Hazard Perry* class, head of the Royal Corps of Naval Constructors, R.J. Daniels, was invited by an old friend, US Chief of the Bureau of Ships, Adm Robert C Gooding, to advise upon the use of variable-pitch propellers in the class. During the course of this conversation, Daniels warned Gooding against the use of aluminium in the superstructure of the FFG-7 class as he believed it would lead to structural weaknesses. A number of ships subsequently developed structural cracks, including a 40 ft (12 m) fissure in USS *Duncan*, before the problems were remedied.\*[5]

The *Oliver Hazard Perry*-class frigates were designed primarily as anti-aircraft and anti-submarine warfare guided-missile warships intended to provide open-ocean escort of amphibious warfare ships and merchant ship convoys in moderate threat environments in a potential war with the Soviet Union and the Warsaw Pact countries. They could also provide air defense against 1970s- and 1980s-era aircraft and anti-ship missiles. These warships are equipped to escort and protect aircraft carrier battle groups, amphibious landing groups, underway replenishment groups, and merchant ship convoys. They can conduct independent operations to perform such tasks as surveillance of illegal drug smugglers, maritime interception operations, and exercises with other nations.\*[6]

The addition of the Naval Tactical Data System, LAMPS helicopters, and the Tactical Towed Array System (TAC-TAS) gave these warships a combat capability far beyond the original expectations. They are well-suited for the littoral regions and most war-at-sea scenarios.

### 1.1.2 Notable combat actions



*USS Stark listing to port following an air attack*

*Oliver Hazard Perry*-class frigates made worldwide news during the 1980s. Despite being small, these frigates were shown to be extremely durable. During the Iran–Iraq War, on 17 May 1987, *USS Stark* was attacked by an Iraqi warplane. Struck by two Exocet anti-ship missiles, thirty-seven U.S. Navy sailors died in the deadly prelude to the American Operation Earnest Will, the reflagging and escorting of oil tankers through the Persian Gulf and the Straits of Hormuz.

Less than a year later, on 14 April 1988, *USS Samuel B. Roberts* was nearly sunk by an Iranian mine. No lives were lost, but 10 sailors were evacuated from the warship for medical treatment. The crew of *Samuel B. Roberts* battled fire and flooding for two days, ultimately managing to save the ship. The U.S. Navy retaliated four days later with Operation Praying Mantis, a one-day attack on Iranian oil platforms being used as bases for raids on merchant shipping. Those had included bases for the minelaying operations that damaged *Samuel B. Roberts*. Both frigates were repaired in American shipyards and returned to full service. *Stark* was decommissioned in 1999, and scrapped in 2006.

On April 18, 1988, *USS Simpson* was accompanying the cruiser *USS Wainwright* and frigate *USS Bagley* when they came under attack from the Iranian gunboat *Joshan* which fired a U.S. made Harpoon missile at the ships. With *Simpson* having the only clear shot, the frigate fired an SM-1 standard missile which struck *Joshan*. *Simpson* fired three more SM-1s, and with later naval fire from *Wainwright*, sunk the Iranian vessel.\*[7]

### 1.1.3 Modifications

#### United States

The U.S. Navy and Royal Australian Navy have modified their remaining Perrys to reduce their operating costs, replacing Detroit Diesel Company 16V149TI electrical generators with Caterpillar, Inc.- 3512B diesel engines.

In mid-2000, the U.S.Navy removed the frigates' Mk 13 single-arm missile launchers and magazines because the primary missile, the Standard SM-1MR, became outmoded.\* [8]



*USS Rodney M. Davis after the removal of her foredeck Mk 13 missile launcher.*

The “zone-defense” anti-aircraft warfare (AAW) capability has vanished, and all that remains is a “point-defense” type of anti-air warfare (AAW) armament. It would supposedly have been too costly to refit the Standard Missile SM-1MR missiles, which had little ability to bring down sea-skimming missiles. Another reason is to allow more SM-1MRs to go to American allies that operate *Perrys*, such as Poland, Spain, Australia, Turkey, and Taiwan.

The loss of the launchers also stripped the frigates of their Harpoon anti-ship missiles. However, their Seahawk helicopters can carry the much shorter-range Penguin and Hellfire anti-ship missiles.

The last nine ships of the class have new remotely operated 25 mm Mk 38 Mod 2 Naval Gun Systems installed on platforms over the old MK 13 launcher magazine.



*USS Ford with Mk 38 Mod 2 Bushmaster gun.*

As of 2002, the U.S. Navy updated the remaining active *Oliver Hazard Perry*-class warships' Phalanx CIWS to the “Block 1B” capability, which allowed the Mk 15 20 mm Phalanx gun to shoot at fast-moving surface craft and helicopters. They were also to be fitted with the Mk 53 DLS "Nulka" missile decoy system, which will be

better than the presently-equipped chaff (SRBOC, Super Rapid Blooming Offboard Chaff) and flares at guarding against anti-ship missiles. It had been planned to outfit the remaining ships with one 32-cell RIM-116 Rolling Airframe Missile launcher at the location of the former Mk-13, but this did not occur.\* [9]

On May 11, 2009, the first International Frigate Working Group met in Mayport Naval Station to discuss maintenance, obsolescence and logistics issues regarding *Oliver Hazard Perry*-class ships of the U.S. and foreign navies.\* [10]

On June 16, 2009, Vice Admiral Barry McCullough turned down the suggestion of then-U.S. Senator Mel Martinez (R-FL) to keep the *Perrys* in service, citing their worn-out and maxed-out condition.\* [11] However, U.S. Representative Ander Crenshaw (R-FL) and former U.S. Representative Gene Taylor (D-MS) took up the cause to retain the vessels.\* [12]

The *Oliver Hazard Perry*-class frigates were to eventually be replaced by *Littoral Combat Ships* by 2019. However, the worn out frigates were being retired faster than the LCSs are being built, which may lead to a gap in United States Southern Command mission coverage.\* [13] According to Navy deactivation plans, all *Oliver Hazard Perry*-class frigates will be retired by October 2015. *Simpson* was the last to be retired, on 29 September 2015, leaving the Navy devoid of frigates for the first time since 1943. The ships will either be made available for sale to foreign navies or dismantled.\* [14] *Perry*-class frigate retirement was accelerated by budget pressures, which will lead to the remaining 11 ships being replaced by only eight LCS hulls. With the timeline LCS mission packages will come online unknown, there is uncertainty if they will be able to perform the frigates' counter-narcotics and anti-submarine roles when they are gone. The Navy is looking into *Military Sealift Command* to see if the *Joint High Speed Vessel*, *Mobile Landing Platform*, and other auxiliary ships could handle low-end missions that the frigates performed.\* [15]

The U.S. Coast Guard is harvesting weapons systems components from decommissioned Navy *Perry*-class frigates to save money. Harvesting components from four decommissioned frigates results in more than \$24 million in cost savings, which increases with parts from more decommissioned frigates. Equipment including Mk 75, 76 mm/62 caliber gun mounts, gun control panels, barrels, launchers, junction boxes, and other components will be returned to service aboard *Famous*-class cutters to extend their service lives into the 2030s.\* [16]

## Australia

Australia is spending A\$1.46bn to upgrade Royal Australian Navy (RAN) *Adelaide*-class guided-missile frigates, including equipping them to fire the SM-2 version of the Standard missile, adding an eight-cell Mk-

41 vertical launch system for Evolved Sea Sparrow missiles, and installing better air-search radars and long-range sonar.

The first of the upgraded frigates, *HMAS Sydney*, returned to the RAN fleet in 2005. Each of the four frigates to be upgraded have the work at the *Garden Island* shipyard in Sydney, Australia, with the modernizations lasting between 18 months and two years. These frigates are planned to be replaced starting in 2013 by three new *Hobart*-class air warfare destroyers equipped with the AEGIS combat system. However, the third of those destroyers will not be commissioned until 2017, at the earliest.

The cost will be partly offset, in the short run, by the decommissioning and disposal of the two older frigates. *HMAS Canberra* was decommissioned on 12 November 2005 at naval base *HMAS Stirling* in Western Australia and *HMAS Adelaide* was decommissioned at that same naval base on 20 January 2008.

## Turkey

The Turkish Navy had commenced the modernization of its G-class frigates with the GENESIS (Gemi Entegre Savaş İdare Sistemi) combat management system in 2007.\*[17] The first GENESIS upgraded ship was delivered in 2007, and the last delivery is scheduled for 2011.\*[18] The “short-hull” *Oliver Hazard Perry*-class frigates that are currently part of the Turkish Navy were modified with the ASIST landing platform system at the Gölcük Naval Shipyard, so that they can accommodate the S-70B Seahawk helicopters. Turkey is planning to add one eight-cell Mk 41 Vertical Launching System (VLS) for the Evolved Sea Sparrow missile, to be installed forward of the present Mk 13 missile launchers, similar to the case in the modernization program of the Australian *Adelaide*-class frigates.\*[19]\*[20]\*[21] TCG *Gediz* was the first ship in the class to receive the Mk 41 VLS installation.\*[22] There are also plans for new components to be installed that are being developed for the Milgem-class warships (*Ada*-class corvettes and F-100-class frigates) of the Turkish Navy. These include modern Three-dimensional and X-band radars developed by Aselsan and Turkish-made hull-mounted sonars. One of the G-class frigates will also be used as a test-bed for Turkey’s 6,000+ ton TF2000-class AAW frigates that are currently being designed by the Turkish Naval Institute.

### 1.1.4 Operators

- United States: The U.S. Navy commissioned 51 FFG-7 class frigates between 1977 and 1989. The last of these, *Simpson*, was decommissioned in 29 September 2015.\*[23]
- Australia (*Adelaide* class): The Royal Australian Navy purchased six frigates. Four of them

were built in the United States while the other two were built in Australia. Four of the ships were upgraded with the addition of an eight-cell Mk 41 VLS with 32 Evolved Sea Sparrow (ESSM) missiles, and the Standard Missile SM-2, plus upgraded radars and sonars while the other two ships were decommissioned.

- Bahrain: USS *Jack Williams* was purchased from the American government in 1996 and rechristened *Sabha*.
- Egypt: Four *Oliver Hazard Perry*-class frigates transferred from the U.S. Navy.
- Pakistan: Six to be transferred,\*[24] The former *USS McInerney* transferred to Pakistani Navy in August 2010.\*[25]
- Poland: Two frigates were transferred from the U.S. Navy in 2002 and 2003.
- Taiwan (*Cheng Kung* class): Taiwanese-built. Originally eight ships were equipped with eight Hsing Feng II anti-ship missiles, now all but PFG-1103 are carrying four HF-2 and four HF-3 supersonic ASHMs. The PFG-1103 Cheng Ho will change the anti-ship mix upon their major overhaul. Seven out of eight ships added Bofors 40 mm/L70 guns for both surface and anti-air use. On November 5, 2012 Minister of Defense Kao announced the U.S. government will sell Taiwan two additional *Perry*-class frigates that are about to be retired from the U.S. Navy for a cost of US\$240 million to be retrofitted and delivered in 2015.\*[26]
- Spain (*Santa Maria* class): Spanish-built: six frigates.
- Turkey (G class): Eight former U.S. Navy *Oliver Hazard Perry*-class frigates have been transferred to the Turkish Navy. All have undergone extensive advanced modernization programs, and they are now known as the G-class frigates. The Turkish Navy modernized G-class frigates have an additional Mk-41 Vertical Launch System capable of launching Evolved Sea Sparrow missiles for close-in, as well as their longer-range SM-1 missiles; advanced digital fire control systems and new Turkish-made sonars.
- Thailand: Two former U.S. Navy *Oliver Hazard Perry*-class frigates are allocated by the US government to the Royal Thai Navy, subject to acceptance by the Thai government: the former *USS Rentz* and *USS Vandegrift*.\*[27]

### 1.1.5 List of vessels

### 1.1.6 Related legislation

On April 7, 2014, the United States House of Representatives voted to pass the Taiwan Relations Act Affirmation and Naval Vessel Transfer Act of 2014 (H.R. 3470; 113th Congress),<sup>\*[32]</sup> a bill that would allow eight more *Perry* frigates to be transferred to foreign countries. The bill would authorize the President to transfer *Curts* and *McClusky* to Mexico, and *Rentz* and *Vandegrift* to Thailand.<sup>\*[32]</sup> The bill would also authorize the President to sell four units (*Taylor*, *Gary*, *Carr*, and *Elrod*) to the Taipei Economic and Cultural Representative Office of the United States (which is the Taiwan agency designated pursuant to the Taiwan Relations Act) for about \$10 million each.<sup>\*[33]</sup>

### 1.1.7 References

- [1] Wiggins, James F (August 2000). *Defense Acquisitions: Comprehensive Strategy Needed to Improve Ship Cruise Missile Defence*. United States General Accounting Office. ISBN 978-0-7567-0302-8. Retrieved 2010-02-16. pp.42
- [2] <http://www.naval-technology.com/news/news-us-navy-decommissions-last-oliver-hazard-perry-class-frigates/>
- [3] Vergakis, Brock (January 7, 2015). “Last deployment: All Navy frigates soon to be decommissioned” . Associated Press. Retrieved January 7, 2015.
- [4] Rogoway, Tyler (January 10, 2014). “End Of The 'Ghetto Navy' Is In Sight As Last USN Frigate Cruise Begins” . *Fox Trot Alpha*. Retrieved January 10, 2014.
- [5] Daniels, R.J, p.219, *The End Of An Era: The Memoirs Of A Naval Constructor*, Periscope Publishing Ltd, 2004, ISBN 1-904381-18-9, ISBN 978-1-904381-18-1
- [6] Raleigh Clayton Muns, Oliver Hazard Perry Class Frigates: United States Navy (2010), p.3
- [7] Lendon, Brad. “Hours before decommissioning, USS Simpson crew recall historic naval battle” . CNN. CNN. Retrieved 30 September 2015.
- [8] Burgess, Richard R. (September 2003). “Guided Missiles Removed from Perry-class Frigates (Sea Services section: Northrop Grumman-Built DDG Mustin Commissioned in U.S. Pacific Fleet)”. *Sea Power* (Washington, D.C.: Navy League of the United States) **46** (9): 34. ISSN 0199-1337. OCLC 3324011. Retrieved 2008-09-22.
- [9] *The Naval Institute Guide to the Ships and Aircraft of the U.S. Fleet* Norman Polmar. Naval Institute Press, 2005. page 161
- [10] Mayport hosts frigate working group
- [11] Navy has few FFG options to fill LCS gap
- [12] Mayport frigates may get reprieve
- [13] Faram, Mark D. “Keeping frigates running no easy feat for crews.” *Navy Times*, May 29, 2012.
- [14] Decommissioning plan pulls all frigates from fleet by end of FY '15 - Militarytimes.com, 2 July 2014
- [15] Retiring frigates may leave some missions unfilled - Navy-times.com, 26 July 2014
- [16] U.S. Navy harvests decommissioned Frigates weapon systems for U.S. Coast Guard use - Navyrecognition.com, 26 October 2014
- [17] Undersecretariat of Turkish Defence Industries: GENESIS modernization program
- [18] Turkish Navy official website: GENESIS modernization program
- [19] MK 41 Vertical Launch Systems for Turkish Navy : Naval Forces : Defense News Air Force Army Navy News
- [20] MK 41 Naval Vertical Missile Launch Systems Delivered, Supported (updated)
- [21] FMS: Turkey Requests MK 41 Vertical Launch Systems
- [22] Turkishnavy.net: First Turkish Perry With Mk-41 VLS
- [23] “Frigates - FFG” US Navy. 29 September 2015. Retrieved 6 October 2015.
- [24] Official Website - Frigates Archived October 23, 2014 at the Wayback Machine
- [25] Pakistan to get refurbished warship from US Times of India, October 19, 2008
- [26] “Taiwan to buy Perry-class frigates from U.S.”
- [27] <http://defense-studies.blogspot.com/2013/01/us-transfers-two-ohp-class-frigates-to.html>
- [28] “SEA 21 Navy Inactive Ships Office” . Retrieved 2 Oct 2015.
- [29] *HMAS Sydney decommissioned after 32 years of service*, ABC News, 30 November 2015
- [30] *Final West Coast Frigate, USS Gary, Decommissioned*: by Mass Communication Specialist 1st Class Trevor Welsh, Naval Surface Force, U.S. Pacific Fleet Public Affairs. Story Number: NNS150724-01, release date: 24 July 2015.
- [31] *USS Kauffman to be Decommissioned*, Story Number: NNS150917-15 from USS Kauffman Public Affairs, 17 September 2015.
- [32] “H.R. 3470 - Summary” . United States Congress. Retrieved 8 April 2014.
- [33] “H.R. 3470 - CBO” (PDF). Congressional Budget Office. Retrieved 5 April 2014.

### 1.1.8 Further reading

- Bruhn, David D., Steven C. Saulnier, and James L. Whittington (1997). *Ready to Answer All Bells: A Blueprint for Successful Naval Engineering*. Annapolis: Naval Institute Press. ISBN 1-55750-227-7. (Operating a Perry frigate)
- Friedman, Norman (1982). *U.S. Destroyers: An Illustrated Design History*. Annapolis: Naval Institute Press. ISBN 0-87021-733-X. (Contains material on frigates and Perrys in particular)
- Levinson, Jeffrey L. and Randy L. Edwards (1997). *Missile Inbound*. Annapolis: Naval Institute Press. ISBN 1-55750-517-9. (Attack on the USS Stark (FFG 31))
- Peniston, Bradley (2006). *No Higher Honor: Saving the USS Samuel B. Roberts in the Persian Gulf*. Annapolis: Naval Institute Press. ISBN 1-59114-661-5. (Mining of the USS *Samuel B. Roberts* (FFG 58))
- Snow, Ralph L. (1987). *Bath Iron Works: The First Hundred Years*. Bath, Maine: Maine Maritime Museum. ISBN 0-9619449-0-0. (The origin and construction of the Perrys, from the design shipyard's point of view.)
- Wise, Harold Lee (2007). *Inside the Danger Zone: The U.S. Military in the Persian Gulf 1987-88*. Annapolis: Naval Institute Press. ISBN 1-59114-970-3.

### 1.1.9 External links

- *Oliver Hazard Perry*-class frigates at Destroyer History Foundation
- *Oliver Hazard Perry class frigates*: United States Navy Wikipedia book created 20 October 2009 at Internet Archive
- Official U.S. Navy Fact File: Frigates
- FFG-7 OLIVER HAZARD PERRY-class: by the Federation of American Scientists
- MaritimeQuest Perry Class Overview
- Launch of FFG 58

## 1.2 Oliver Hazard Perry

This article is about the naval officer. For the U.S. Navy frigate, see *Oliver Hazard Perry*-class frigate.

**Oliver Hazard Perry** (August 23, 1785 – August 23, 1819) was an American naval commander, born in South

Kingstown, Rhode Island. He was the son of USN Captain Christopher Raymond Perry and Sarah Wallace Alexander, and the older brother of Commodore Matthew Calbraith Perry.

Perry served in the West Indies during the Quasi War with France, the Mediterranean during the Barbary Wars, in the Caribbean fighting piracy and the slave trade, but is most noted for his heroic role in the War of 1812 during the Battle of Lake Erie.\* [1] During the War of 1812 against Britain, Perry supervised the building of a fleet at Erie, Pennsylvania, at the age of 27. He earned the title "Hero of Lake Erie" for leading American forces in a decisive naval victory at the Battle of Lake Erie, receiving a Congressional Gold Medal and the Thanks of Congress.\* [2]\* [3] His leadership materially aided the successful outcomes of all nine Lake Erie military campaign victories, and the fleet victory was a turning point in the battle for the west in the War of 1812.\* [3] He is remembered for the words on his battle flag, "Don't Give Up the Ship" and his message to General William Henry Harrison which reads in part, "We have met the enemy and they are ours; ..."

Perry became embroiled in a long-standing and festering controversy with the Commander of USS *Niagara*, Captain Jesse Elliott, over their conduct in the battle, and both were the subject of official charges that were lodged. In 1815, he successfully commanded *Java* in the Mediterranean during the Second Barbary War. So seminal was his career that he was lionized in the press (being the subject of scores of books and articles),\* [4] has been heavily memorialized, and many places and ships have been named in his honor.

### 1.2.1 Childhood and early life

As a boy, Perry lived in Tower Hill, Rhode Island,\* [5] sailing ships in anticipation of his future career as an officer in the US Navy.\* [3] He was the oldest of five boys, born to Christopher Perry, his father and Sarah Perry, his mother. Perry came from a long line of accomplished naval men from both sides of his family. His mother taught Perry and his younger brothers to read and write and had them attend Trinity Episcopal Church regularly, where he was baptized by Reverend William Smith at the age of nine. Theodore Dehon, rector of the church from 1797 to 1810 had a significant influence of the young Perry.\* [6] He was educated in Newport, Rhode Island.

### 1.2.2 Early naval career

By the age of twelve, Perry had sailed with his father to the West Indies and by at the age of 13 was appointed a midshipman in the United States Navy on April 7, 1799, aboard USS *General Greene*, commanded by his father who was a captain. Their first stop was in Cuba to receive US merchant ships and provide them escort from Havana

to the United States.\*[3]\*[7] During the Quasi-War with France, he served on this frigate.\*[8] He first experienced combat on February 9, 1800, off the coast of the French colony of **Haiti**, which was in a state of rebellion.\*[9]\*[10]

During the First Barbary War, he served in **USS Adams**\*[11] and later commanded the **USS Nautilus** during the capture of Derna. Beginning in 1806, he commanded the sloop **USS Revenge**, engaging in patrol duties to enforce the **Embargo Act**, as well as a successful raid to regain a U.S. ship held in Spanish territory in Florida. On January 9, 1811, *Revenge* ran aground off Rhode Island and was lost. “Seeing fairly quickly that he could not save the vessel, [Perry] turned his attention to saving the crew, and after helping them down the ropes over the vessel's stern, he was the last to leave the vessel.”\*[12]\*:61 The following court-martial exonerated Perry, placing blame on the ship's pilot.\*[upper-alpha 1]\*[13] In January 2011, a team of divers claimed to have discovered the remains of *Revenge*, nearly 200 years to the day after it sank.\*[14]\*[15]

Following the court-martial, Perry was given a leave of absence from the navy. On May 5, 1811, he married Elizabeth Champlin Mason of Newport, Rhode Island, whom he had met at a dance in 1807.\*[13] They enjoyed an extended honeymoon touring New England. The couple would eventually have five children, with one dying in infancy.\*[16]

### 1.2.3 War of 1812

At the beginning of the War of 1812 the British Navy controlled the Great Lakes, except for Lake Huron, while the American Navy controlled Lake Champlain.\*[17] American naval forces were very small, allowing the British to make many advances in the Great Lakes and northern New York waterways. The roles played by commanders like Oliver Hazard Perry, at Lake Erie and Isaac Chauncey at Lake Ontario and Thomas Macdonough at Lake Champlain all proved vital to the naval effort that provided the most redeeming military feature of that war. Naval historian E. B. Potter noted that “all naval officers of the day made a special study of Nelson's battles”. Oliver Perry was no exception.\*[18] At his request he was given command of United States naval forces on Lake Erie during the War of 1812. U.S. Secretary of the Navy Paul Hamilton had charged prominent merchant seaman Daniel Dobbins with building the American fleet on Presque Isle Bay at Erie, Pennsylvania, and Perry was named chief naval officer.\*[2]\*[3]\*[19]

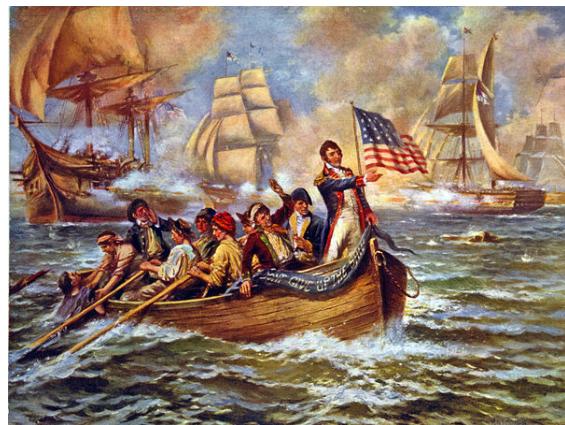
Perry knew battle was coming, and he “consciously followed Nelson's example in describing his battle plans to his captains.”\*[18]\*:218 Perry's instructions were:

*Commanding officers are particularly enjoined to pay attention in preserving their stations in the Line, and in all cases to keep as near*

*the Lawrence as possible. ...Engage your designated adversary, in close action, at half cable's length.* \*[upper-alpha 2]\*[20]

—Oliver H. Perry, General Order, USS Lawrence

### Hero of Lake Erie

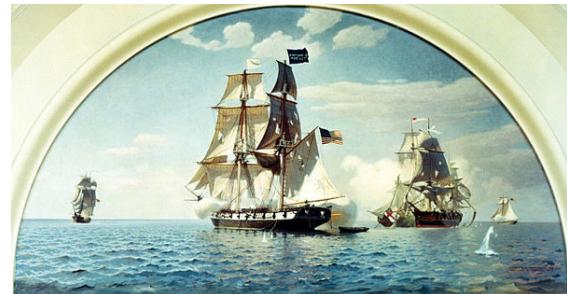


Perry (standing) after abandoning Lawrence in a 1911 painting by Edward Percy Moran

On September 10, 1813, Perry's command fought a successful fleet action against a task force of the Royal Navy in the **Battle of Lake Erie**. It was at the outset of this battle that Perry famously said, “If a victory is to be gained, I will gain it.”\*[21] Initially, the exchange of gunfire favored the British. Perry's flagship, the **USS Lawrence**, was so severely disabled in the encounter that the British commander, Robert Heriot Barclay, thought that Perry would surrender it, and sent a small boat to request that the American vessel pull down its flag. Faithful to the words of his battle flag, “DON'T GIVE UP THE SHIP” (a paraphrase of the dying words of Captain James Lawrence, the ship's namesake and Perry's friend),\*[22]\*[23] Perry, with *Lawrence's* chaplain and purser as the remaining able crew, personally fired the final salvo,\*[24] and then had his men row him a half-mile (0.8 km) through heavy gunfire to transfer his command to **USS Niagara**. Once aboard, Perry dispatched *Niagara*'s commander, Captain Jesse Elliot, to bring the other schooners into closer action while he steered the *Niagara* toward the damaged British ships. Like Nelson's *Victory* at Trafalgar, *Niagara* broke the opposing line. Perry's force pounded Barclay's ships until they could offer no effective resistance and surrendered. Although he had won the battle aboard *Niagara*, he received the British surrender on the deck of the recaptured *Lawrence* to allow the British to see the terrible price his men had paid.\*[21] Perry's battle report to General William Henry Harrison was famously brief: “We have met the enemy and they are ours; two ships, two brigs, one schooner and one sloop.”\*[22]\*[upper-alpha 3]



*Perry's battle flag*



*Niagara joins the battle.  
Detroit and Queen Charlotte at right.*

This was the first time in history that an entire British naval squadron had surrendered, and every captured ship was successfully returned to Presque Isle.\* [25]\*[26]

Although the engagement was small compared to Napoleonic naval battles such as the *Battle of Trafalgar*, the victory had disproportionate strategic importance, opening Canada up to possible invasion, while simultaneously protecting the entire *Ohio Valley*.\* [3]\*[27] The loss of the British squadron directly led to the critical *Battle of the Thames*, the rout of British forces by Harrison's army, the death of *Tecumseh*, and the breakup of his Indian alliance.\*[26] Along with the *Battle of Plattsburgh*, it was one of only two significant fleet victories of the war.\*[3]

In fact, Perry was involved in nine battles that led to and followed the *Battle of Lake Erie*, and they all had a seminal impact. “What is often overlooked when studying Perry is how his physical participation and brilliant strategic leadership influenced the outcomes of all nine Lake Erie military campaign victories.” Capturing *Fort George, Ontario* in the *Battle of Fort George*; Destroying the British munitions at *Olde Fort Erie* (see *Capture of Fort Erie*); Rescuing five vessels from *Black Rock*; Building the *Erie* fleet; Getting the ships over the sandbar; Blocking British supplies for a month prior to battle; Planning the *Thames* invasion with General Harrison; Winning the *Battle of Lake Erie*; and Winning the *Battle of Thames*.\* [3]\*[26]

### Perry–Elliott controversy

While Nelson had his *Collingwood*, Perry had his Elliott, and was considerably less well served. Jesse Elliott, while serving with *Isaac Chauncey* at *Lake Ontario*, was tasked to augment Perry's squadron with 11 officers and 91 men, “and none were sent but the worst.”\* [28] Subsequently detailed by Chauncey to command *Niagara*, Elliott stated “that if he could have foreseen that he himself should be sent to *Lake Erie*, his selections would have been different.”\* [28] Elliott then appropriated the “best of the worst” for *Niagara*; and Perry “in the interest of harmony” accepted the situation, though with growing ill-will.\*[28]

In his initial post-action report, Perry had praised Captain Elliott's role in the American victory at *Lake Erie*; and as news of the battle spread, Perry and Elliott were both celebrated as national heroes. Soon after, however, several junior officers publicly criticized Elliott's performance during the battle, charging that Elliott allowed *Lawrence* to suffer the brunt of the British fire while holding *Niagara* back from the fight. William Vigneron Taylor, Perry's sailing master, in a letter to Taylor's wife, put it thus:

*The Lawrence alone rec'd the fire of the whole British squadron 2 1/2 hours within pistol shot—we were not supported as we ought to have been. Captain Perry led the Lawrence into action & sustained the most destructive fire with the most gallant spirit perhaps that was ever witnessed under similar circumstances.\* [29]*

—William Taylor, 15 September 1813

The meeting between Elliott and Perry on the deck of *Niagara* was terse. Elliott inquired how the day was going. Perry replied, “Badly.” Elliott then volunteered to take Perry's small boat and rally the schooners, and Perry acquiesced.\* [20]\*:49 As Perry turned *Niagara* into the battle, Elliott was not aboard. Elliott's rejoinder to history's criticism of inaction was that there had been a lack of effective signaling. Charges were filed but were not officially acted upon. Attempting to restore his honor, Elliott and his supporters began a 30-year campaign that would outlive both men and ultimately leave his reputation in tatters.\*[26]

### Congressional Gold Medal

On January 6, 1814, Perry was honored with a Congressional Gold Medal,\*[30] the Thanks of Congress, and a promotion to the rank of Captain.\*[31]\*[32] This was one of 27 Gold Medals authorized by Congress arising from the War of 1812.\*[33]

Elliott was also recognized with a Congressional Gold Medal\* [30] and the Thanks of Congress for his actions in

the Battle of Lake Erie. This recognition would prove to fan the flames of resentment on both sides of the Elliott-Perry controversy.\*[26]

In recognition of his victory at Lake Erie, in 1813 Perry was elected as an honorary member of the New York Society of the Cincinnati.

#### 1.2.4 Later commands and controversies



*USN engraved portrait of  
Commodore Perry*

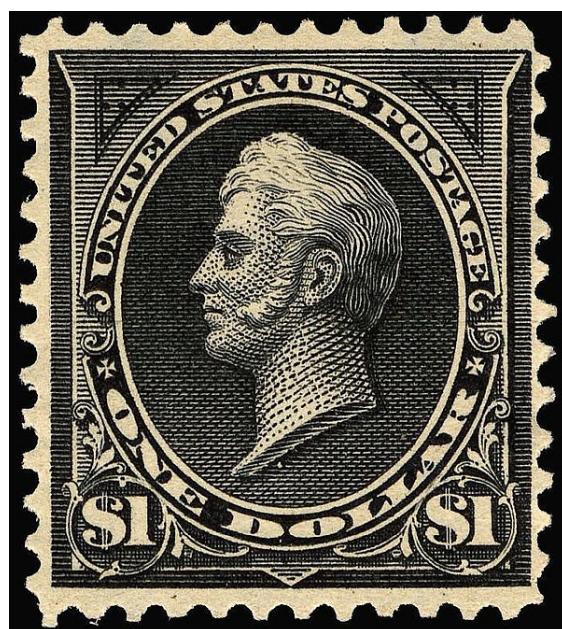
In July 1814, Perry was offered command of *Java*, a 44-gun frigate which was under construction in Baltimore. While overseeing the outfitting of *Java*, Perry participated in the defenses of Baltimore and Washington, D.C. during the British invasion of the Chesapeake Bay. In a twist of irony, these land battles would be the last time the career naval officer saw combat. The Treaty of Ghent was signed before *Java* could be put to sea.\*[16]

For Perry, the post-war years were marred by controversies. In 1815, he commanded *Java* in the Mediterranean during the Second Barbary War. While moored in Naples, Perry was provoked into slapping the commander of the ship's Marines, John Heath. The ensuing court-martial found both men guilty but levied only mild reprimands. After the crew returned home, Heath challenged Perry to a pistol duel, which was fought on October 19, 1817, on the same Weehawken, New Jersey, field where Aaron Burr shot Alexander Hamilton. Heath fired first and missed. Perry refused to fire, satisfying the Marine's honor.\*[16]

Perry's return from the Mediterranean also reignited the feud with Elliott. After an exchange of angry letters,

Elliott challenged Perry to a duel, which Perry refused. He instead decided to file formal court-martial charges against Elliott, including "conduct unbecoming an officer," and failure to "do his utmost to take or destroy the vessel of the enemy which it was his duty to encounter." Wishing to avoid a scandal between two congressionally decorated naval heroes, Secretary of the Navy Smith Thompson and President James Monroe suppressed the matter by offering Perry the rank of Commodore and a diplomatic mission to South America in exchange for dropping his charges against Elliott. This put an official end to the controversy, though it would continue to be debated for another quarter century.\*[36]

#### 1.2.5 Death and legacy



*Oliver Hazard Perry*

*Issue of 1894 ---- Other stamps depicting Perry:*

In 1819, after a successful expedition to Venezuela's Orinoco River to consult with Simon Bolivar about piracy in the Caribbean, Perry contracted yellow fever from mosquitoes while aboard *USS Nonsuch*. Despite the crew's efforts to reach *Trinidad* for medical assistance, the Commodore died on his 34th birthday as the ship was nearing *Port of Spain*. After being buried in *Port of Spain*, his remains were later taken back to the United States and interred in *Newport*, Rhode Island. After resting briefly in the Old Common Burial Ground, his body was finally moved to *Newport's Island Cemetery*,\*[37]\*[38] where his brother *Matthew C. Perry* is also interred.\*[39]

Perry is shown on the reverse of the 2013 "Perry's Victory and International Peace Memorial Quarter". The reverse



*Oliver Hazard Perry  
Victory Quarter*

design depicts the statue of Perry with the International Peace Memorial in the distance.\*[40]

The family farm in South Kingstown, where Perry was probably born and later built a house, was listed on the National Register of Historic Places in 1982.\*[41]

## 1.2.6 Family

Perry's parents were Christopher Raymond Perry (1761–1818), who was also born in South Kingston, RI, and Sarah Wallace Alexander (1763–1830). Through his mother, Perry was a direct descendant of the uncle of Scottish nobleman William Wallace\*[2] (d. 1305), whose life was the inspiration for the movie *Braveheart*.

Perry married Elizabeth Champlin Mason in 1811. They had five children, four of whom lived to maturity. They were:

1. Christopher Grant Champlin Perry (April 2, 1812 – April 5, 1854) m. Muriel Frances Sergeant of Philadelphia (great-granddaughter of Benjamin Franklin); their daughter Margaret Mason Perry married the artist John LaFarge;
2. Oliver Hazard Perry II (February 23, 1813 – March 4, 1814) died in infancy;
3. Oliver Hazard Perry, Jr. (February 23, 1815 – August 20, 1878) m. 1) Elizabeth Ann Randolph (1816–1847) (Virginia Randolph family) and m. 2) Mary Ann Moseley;
4. Christopher Raymond Perry (June 29, 1816 – October 8, 1848) never married;

5. Elizabeth Mason Perry m., as his 2nd wife, the Reverend Francis Vinton, rector of Trinity Episcopal Church in Newport.

Perry's son Christopher Grant Champlin Perry served as commander of the Artillery Company of Newport from 1848 until his death in 1854.

Oliver Hazard Perry, Jr. entered the Navy as a midshipman in 1829, rose to the rank of lieutenant and resigned in 1849.

Christopher Raymond Perry graduated from the United States Military Academy at West Point in 1842. He served during the Mexican War and fought at the Battle of Palo Alto on May 8, 1846 and at the Battle of Resaca-de-la-Palma on May 9, 1846. He died on active duty as a 1st lieutenant in 1848.\*[42]

His family's descendants include Commander John Rodgers, the second person to become a United States naval aviator,\*[43] and well known civilian aviator Calbraith Perry Rodgers, the first person to fly an airplane—the *Vin Fiz*—across the United States.\*[44]

Oliver Hazard Perry La Farge (December 19, 1901 – August 2, 1963) was an American writer and anthropologist, best known for his 1930 Pulitzer Prize-winning novel *Laughing Boy*.

His great nephew Oliver Hazard Perry Belmont (November 12, 1858 – June 10, 1908) was an American socialite and United States Representative from New York.

Oliver Hazard Perry Throck Morton (August 4, 1823 – November 1, 1877) (no relation)—the 14th Governor of Indiana, a famous Republican politician and U.S. Senator, who was a leader among the Radical Republican reconstructionists—was named in his honor.\*[45]

## 1.2.7 Geographical namesakes

Many locations, both in Rhode Island and near Lake Erie, are named in his honor, including:

### Counties and municipalities (organized by state)

- All of the ten Perry counties in the U.S.
- Perryville and Perry County, Missouri
- The hamlet of Perrysburg and the surrounding township; and the Village of Perry, New York and the surrounding township,\*[46]
- The city of Perry, Georgia
- The Cities of Perrysburg,\*[upper-alpha 4] Perrysville, North Perry and Perry; Perrysburg Township; and Perry County, Ohio.

- The borough of Perryopolis and Oliver Township, within Perry County, and Oliver Township and Perry Township in Jefferson County, Pennsylvania.\*[47]
- The Village of Perryville in the Town of South Kingstown, Rhode Island. The portion of U.S. Route 1 near Perryville is named the *Commodore Oliver Hazard Perry Highway* and Perry Street in Newport.\*[48]
- The City of Hazard in Perry County, Kentucky.\*[49]
- Perry County, Tennessee

### 1.2.8 Monuments



*Commodore Oliver Hazard Perry Statue in Newport, RI by William Greene Turner*

Monuments to Perry are located in many locations, including:

- Perry's Victory and International Peace Memorial at Put-In-Bay, Ohio – 352 ft. (107 m) monument –

the world's most massive Doric column – was constructed in Put-in-Bay, Ohio by a multi-state commission from 1912 to 1915.\*[50]

- Perry Monument at Misery Bay, Presque Isle State Park in Erie, Pennsylvania
- Front Park, by Charles Henry Niehaus, in Buffalo, New York, dedicated September 25, 1916
- Wade Park by William Walcutt, and Herman Matzen, in Cleveland, Ohio\*[51] Dedicated June 14, 1929
- Perry Square, monument designed by Paul Philippe Cret, in Erie, Pennsylvania, 1925
- Eisenhower Park in Newport, RI, statue by William Greene Turner, dedicated September 10, 1885, the 72nd anniversary of the Battle of Lake Erie.\*[52]
- Trinity Episcopal Church in Newport, RI, memorial plaque
- Rhode Island State House in Providence, RI, statue near the south front and a portrait in the Executive Chamber
- In April 1925, Captain Henry E. Lackey took the newly commissioned light cruiser USS *Memphis* (CL-13) and was the U.S. naval representative at the opening of the Oliver Hazard Perry Memorial Gateway in Port-of-Spain, Trinidad.\*[53]\*[54]

### 1.2.9 Eponymous ships

Commodore Perry has been repeatedly honored with ships bearing his name.

- USS *Perry* (1843), a sailing brig 1843–1865.
- USS *Commodore Perry* (1859) was an armed side wheel ferry built in 1859 by Stack and Joyce, Williamsburg, N.Y. and purchased by the Navy October 2, 1861; and commissioned later in the month, Acting Master F. J. Thomas was in command.\*[55]
- USS *Perry* (DD-11), a *Bainbridge*-class destroyer 1900–1919.
- USS *Perry* (DD-340), a *Clemson*-class destroyer converted into a high speed minesweeper and redesignated DMS-17 effective November 19, 1940. Served 1921–1944; sunk in Battle of Peleliu.
- Oliver Hazard Perry - USAT 2725 a Liberty ship. See List of Liberty ships (M–R).\*[56]
- USS *Perry* (DD-844), was a *Gearing*-class destroyer 1945–1970.

- USS *Oliver Hazard Perry* (FFG-7), a guided-missile frigate 1976–1997 and the *Oliver Hazard Perry*-class frigates are named in his honor. The Navy built 51 of the Oliver Hazard Perry-class frigates, with the first going into service in 1977, and the last to be finally moth-balled in 2015.\*[57]\*[58] See also USS Perry.
- SSV *Oliver Hazard Perry* Rhode Island Educational Foundation tall ship.

## 1.2.10 See also

- USS *Niagara* (1813)
- List of books about the War of 1812
- Bibliography of early American naval history

## 1.2.11 Notes

### Footnotes

- [1] His progression from being the subject of a court-martial for running aground to being a formidable commander who made a real difference has a striking parallel to the career of Admiral Chester W. Nimitz.
- [2] A “cable” is 720 feet in the Royal Navy, 600 feet (183 m) in the U.S. Navy. “Half cable's length” would be less than 330 feet (100 m).
- [3] The British order of battle was actually two ships, one brig, two schooners and one sloop.\*[24]\*:260–261 “Perry's message was inaccurate.” \* [20]\*:Note 129, p. 97.
- [4] There is a monument of him on the river near the PYC (Perrysburg Yacht Club). This town also is the home of Fort Meigs

### Citations

- [1] Skaggs, 2006, p. xi
- [2] White, 1895, p. 288
- [3] Bloom, Page essay
- [4] Paullin, 1918, See *Bibliography*
- [5] Capace, Nancy (May 1, 2001). *The Encyclopedia of Rhode Island*. St. Clair Shores, Michigan: Somerset Publishers, Inc. p. 368. ISBN 9780403096107. Retrieved August 23, 2014.
- [6] Skaggs, 2006, p. 6
- [7] Mackenzie, 1840, p. 40
- [8] Barnes, 1912, p. 11
- [9] Brown, 2006, Oliver Hazard Perry, p. 226
- [10] Barnes, 1912, p. 16

- [11] Mackenzie, 1840, pp. 53-55
- [12] Copes, Jan M. (Fall 1994). “The Perry Family: A Newport Naval Dynasty of the Early Republic”. *Newport History: Bulletin of the Newport Historical Society* (Newport, RI: Newport Historical Society). 66, Part 2 (227): 49–77.
- [13] Cooper, James Fenimore (May 1843). *Oliver Hazard Perry* XXII. *Graham's Magazine*. p. 268. Retrieved January 7, 2011.
- [14] “Divers: 1811 Wreck of Perry Ship Discovered Off RI”. New York Times (Associated Press report). January 7, 2011. Retrieved January 7, 2011.
- [15] “Divers Say They've Found 1811 Wreck of Perry Ship”. AOL News. January 8, 2011. Retrieved January 9, 2011.
- [16] “Oliver Hazard Perry – Perry's Victory & International Peace Memorial”. Retrieved 9 June 2012.
- [17] Skaggs, 2006, p. 50
- [18] Potter, 1981, p. 106
- [19] Herring, James; Longacre, James Barton (1854). *The national portrait gallery of distinguished Americans* 1. Philadelphia: D. Rice & A.N. Hart. Retrieved September 3, 2011.
- [20] Altoff, Gerard T. (1999). *Oliver Hazard Perry and the Battle of Lake Erie*. Put-in-Bay, OH: The Perry Group. ISBN 978-1887794039.
- [21] Farmer, Silas. (1884) (Jul 1969) *The history of Detroit and Michigan, or, The metropolis illustrated: a chronological cyclopaedia of the past and present: including a full record of territorial days in Michigan, and the annals of Wayne County*, p. 283 and Various formats at Open Library.
- [22] “Famous Navy Quotes: Who Said Them and When”. Naval History and Heritage Command. Retrieved September 3, 2011.
- [23] Dudley, William S., ed. *The Naval War of 1812: A Documentary History*. vol.2 (Washington, D.C.: US Government Printing Office, 1992), p. 559.
- [24] Roosevelt, Theodore (1889). *The Naval War of 1812 Or The History of the United States Navy during the Last War with Great Britain to Which Is Appended an Account of the Battle of New Orleans* (Tenth ed.). New York: G. P. Putnam's Sons. p. 266.
- [25] Skaggs, 2000, p. 147
- [26] Skaggs, David Curtis (April 2009). “Perry Triumphant”. *Naval History Magazine* (United States Naval Institute) 23 (2). Retrieved September 3, 2011.
- [27] Symonds, Craig L; Clipson, William J. (April 2001) *The Naval Institute historical atlas of the U.S. Navy* Annapolis, Maryland: Naval Institute Press 264pp, ISBN 978-1-55750-984-0; ISBN 1-55750-984-0, p. 48.
- [28] Quoted in Altoff, Gerard T. (1993). *Deep Water Sailors Shallow Water Soldiers: Manning the United States Fleet on Lake Erie – 1813*. Put-in-Bay, OH: The Perry Group. pp. 23–24. ISBN 978-1887794015.

- [29] Taylor, William V. (1813). *Logbook of the USS Lawrence*. Newport, RI: Newport Historical Society.
- [30] J. F. Loubat, LL.D. (1831–1927) (1888). *The Medallic History of the United States of America, 1776–1876. Volume II*. Illustrated by Jaquemart, Jules Ferdinand (1837–1880). N. Flayderman & Co. Retrieved September 3, 2011.
- [31] Lossing, Benson J. (1869). “XVIII – Events on the Northern and Niagara Frontiers in 1812”. *Pictorial Field Book of the War of 1812*. Retrieved September 3, 2011.
- [32] “List of Congressional Gold Medal Recipients”. Clerk of the U.S. House of Representatives. Retrieved September 3, 2011.
- [33] Glassman, Matthew Eric, Analyst for the Congress (June 21, 2010). “Congressional Gold Medals, 1776–2009” : 3. Retrieved September 3, 2011.
- [34] Congressional Gold Medal Honoring Oliver Hazard Perry.
- [35] Snowden, James Ross (1809–1878), Director of the Mint: United States Mint (1861). *A Description of the Medals of Washington; and of other Objects of Interest in the Museum of the Mint. Illustrated, to which are added Biographical Notices of the Directors of the Mint from 1792 to the year 1851*. Philadelphia, Pennsylvania: J. B. Lippincott & Co. pp. 83–84. Retrieved September 3, 2011.
- [36] Skaggs, David Curtis (2006). *Oliver Hazard Perry: Honor, Courage, and Patriotism in the Early U.S. Navy*. Naval Institute Press. pp. 191–199. ISBN 978-1-59114-792-3. Retrieved September 3, 2011.
- [37] Drake, Samuel Adams, 1833–1905. *Nooks and corners of the New England coast*, Rhode Island Cemeteries, p. 401.
- [38] Oliver Hazard Perry at *Find a Grave*
- [39] “Matthew Calbraith Perry (1794–1858) – Find a Grave Memorial”. Retrieved January 9, 2011.
- [40] United States Mint. “Perry's Victory and International Peace Memorial”. United States Mint. Retrieved 8 June 2013.
- [41] “82000020 NRHP nomination for Commodore Oliver Perry Farm” (PDF). Rhode Island Preservation. Retrieved 2014-09-30.
- [42] Christopher R. Perry. “Christopher R. Perry • Cullum's Register • 1163”. Penelope.uchicago.edu. Retrieved 2013-07-10.
- [43] “John Rodgers, Commander, United States Navy”. Arlington National Cemetery Website. Retrieved January 9, 2011.
- [44] Patricia Clark. “Calbraith Rodgers”. Pennsylvania Center for the Book, Penn State. Retrieved January 9, 2011.
- [45] Woollen, William Wesley (1975). *Biographical and Historical Sketches of Early Indiana*. Ayer Publishing. p. 129. ISBN 0-405-06896-4. Retrieved February 16, 2009.
- [46] “Perry, New York Village Information - ePodunk”. epodunk.com.
- [47] Espenshade, Abraham Howry (1925). *Pennsylvania place names*. Pennsylvania State College. p. 337.
- [48] Capace, Nancy (May 1, 2001). *The Encyclopedia of Rhode Island*. St. Clair Shores, Michigan: Somerset Publishers, Inc. pp. 160, 360, 363. ISBN 9780403096107. Retrieved August 23, 2014.
- [49] Bergstrom, Bill (December 11, 1984). “Origins of place names are traced”. *Kentucky New Era*. pp. 2B. Retrieved 29 April 2015.
- [50] Watterson, Henry (1840–1921) (1912). *The Perry memorial and centennial celebration under the auspices of the national government and the states of Ohio, Pennsylvania, Michigan, Illinois, Wisconsin, New York, Rhode Island, Kentucky, Minnesota and Indiana*. Cleveland, Ohio: Interstate Board of the Perry's Victory Centennial Commissioners. Retrieved October 22, 2011.
- [51] Glazier, Capt. William (1886). *Peculiarities of American Cities*. Philadelphia, Pennsylvania: Hubbard Bros. p. 156. Retrieved June 17, 2011.
- [52] Olshan, Matthew (August 20, 2009). “A tale of two statues: A reader’s story about Newport’s Perry monuments prompts an investigation by a Pennsylvania writer”. *The Newport Daily News* (Newport, RI). pp. A9.
- [53] “Papers of Rear Admiral Henry E. Lackey (1899–1940)”. Washington, D.C: Operational Archives Branch, Naval Historical Center. Retrieved September 2, 2011.
- [54] “USS Memphis”. historycentral.com. Retrieved September 2, 2011.
- [55] “Commodore Perry”. The Naval Historical Center. Retrieved September 3, 2011.
- [56] “Liberty Ships built by the United States Maritime Commission in World War II”. usmm.org.
- [57] Vergakis, Brock (January 7, 2015). “Last deployment: All Navy frigates soon to be decommissioned”. Associated Press. Retrieved January 7, 2015.
- [58] Rogoway, Tyler (January 10, 2014). “End Of The 'Ghetto Navy' Is In Sight As Last USN Frigate Cruise Begins”. Fox Trot Alpha. Retrieved January 10, 2014.

## 1.2.12 Bibliography

- **Barnes**, James (1912). *The hero of Erie: (Oliver Hazard Perry)*. D. Appleton & Company, New York, London, p. 167. E'book
- **Bloom**, Loren (2008). “Oliver Hazard Perry – Hero”. Erie Maritime Museum. Retrieved August 25, 2011.
- **Brown**, John Howard. *The Cyclopaedia of American Biography: Comprising the Men and Women of the United States ...*, V6. Kessinger Publishing,. p. 700. ISBN 978-1-4254-8629-7., Book

- **Mackenzie**, Alexander Slidell (1910). *Commodore Oliver Hazard Perry*.: D.M. MacLellan Book Company, New York, NY/Akron, OH. p. 443. E'book
- **Mackenzie**, Alexander Slidell (1840). *The life of Commodore Oliver Hazard Perry 1.* New York: Harper & Brothers. p. 443. E'book
- **Paullin**, Charles Edward (1918). *The Battle of Lake Erie* (a collection of documents, mainly those by Oliver Hazard Perry). Cleveland, Ohio: The Raufin Club. Retrieved August 18, 2011.
- **Potter**, Elmer Belmont (1981). *Sea Power: A Naval History*. Naval Institute Press. p. 419. ISBN 97808070216077., Book
- **Skaggs**, David Curtis (2006). *Oliver Hazard Perry: honor, courage, and patriotism in the early U.S. Navy*. Naval Institute Press. p. 302. ISBN 1-59114-792-1. Url
- **Skaggs**, David Curtis; Altoff, Gerard T. (2000). *A Signal Victory: The Lake Erie Campaign, 1812-1813*. Naval Institute Press,. p. 264. ISBN 9781557508928.
- **White**, James T. (1895). *Oliver Hazard Perry*. National Cyclopaedia of American Biography. p. 288,, Book

### 1.2.13 Further reading

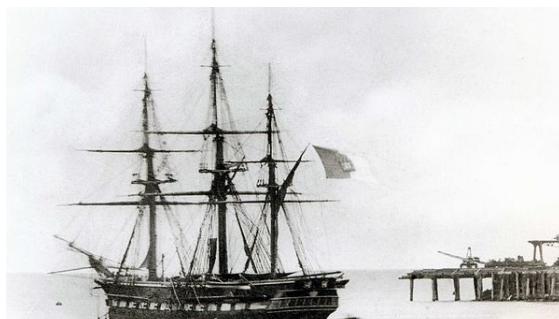
- Axelrod, Alen; Phillips, Charles. *The Macmillan Dictionary of Military Biography* (New York: Macmillan, 1998.) p. 343.
- Bancroft, George, 1800–1891; Dyer, Oliver, 1824–1907. (1891) *History of the battle of Lake Erie: and miscellaneous papers* (New York : R. Bonner's sons) 292 pp. at American Library Association.
- Burges, Tristam (1770–1853) (1839) *Battle of Lake Erie, with notices of Commodore Elliot's conduct in that engagement* (Providence, Brown & Cady) at Internet Archive.
- Conners, William James, 1857–; Emerson, George Douglas. (1916) *The Perrys victory centenary. Report of the Perry's victory centennial commission, state of New York* (Albany, J.B. Lyon Company, Printers).
- Coles, Harry L; Borstin, Daniel J., eds. August 1966 *The War of 1812* (Chicago: University of Chicago Press) ISBN 978-0-226-11350-0.
- Cooper, James Fenimore (1846) *Lives of Distinguished American Naval Officers* Kingman Press and here for American Library Association.
- Cooper, James Fenimore, *History of the Navy* (1839).
- Dillon, Richard. (1978) *We have met the enemy: Oliver Hazard Perry, wilderness commodore* (New York: McGraw-Hill). ISBN 978-0-07-016981-4.
- “Robert J. Dodge Collection – MS 157” . *Center for Archival Collections*. Bowling Green State University. Retrieved October 2, 2011.
- Dodge, Robert J. (1962). *The Battle of Lake Erie*. National Park Service.
- Dutton, Charles J.(1935) *Oliver Hazard Perry* (New York: Longmans, Green and Co.) 308 pp. (Scholar's Bookshelf; First Edition. October 15, 2006) ISBN 0-945726-36-8; ISBN 978-0-945726-36-4.
- Downloadable resources regarding Oliver Hazard Perry, American Library Association.
- Eaton, Joseph Giles (1847–1905) (1905) *Perry's Victory on Lake Erie*. Military Historical Society of Massachusetts (Boston, For the Society, by Houghton Mifflin)at American Library Association.
- Elliott, Jesse D. *Address of Com. Jesse D. Elliott, U.S.N., Delivered in Washington County, Maryland, to His Early Companions at Their Request, on November 24, 1843* (Philadelphia: G.B. Zeiber & co., 1844) 137 pp. at Google books.
- Hickey, Donald R. (1990) *The War of 1812: The Forgotten Conflict* Urbana, Illinois: University of Illinois Press. National Historical Society Book Prize and American Military Institute Best Book Award. ISBN 0-252-06059-8; ISBN 978-0-252-06059-5.
- Hickey, Donald R. (2006) *Don't Give Up the Ship! Myths of the War of 1812*. (Urbana: University of Illinois Press) ISBN 0-252-03179-2.
- Langguth, A. J. (2006). *Union 1812: The Americans Who Fought the Second War of Independence*. New York: Simon & Schuster. ISBN 0-7432-2618-6.
- Lyman, Olin H. (1905) *Commodore Oliver Hazard Perry and the War on the Lakes*.
- Mackenzie, Alexander Slidell 1803–1848. (1915) *Commodore Oliver Hazard Perry : famous American naval hero, victor of the battle of Lake Erie, his life and achievements* (Akron, Ohio: Superior Printing Co.) at Internet archive.
- Mackenzie, Alexander Slidell, 1803–1848 (1840) *The life of Commodore Oliver Hazard Perry*. (New York, Harper) Volume 1, Volume 2.

- Mahan, Alfred Thayer (1840–1914)(1905) *Sea Power in Its Relation to the War of 1812* (2 vols.) (Boston: Little Brown) American Library Association.
- Niles, John Milton (1820). *The Life of Oliver Hazard Perry*. William S. Marsh, Hartford. p. 376., E'book
- Paullin, Charles Edward (October 1918). *The Battle of Lake Erie* (a collection of documents, mainly those by Oliver Hazard Perry). Cleveland, Ohio: The Raufin Club. Retrieved August 18, 2011.
- Morton, Edward Payson (1869–1914) *Lake Erie and the story of Commodore Perry* Chicago: Ainsworth & company Internet Archive digitized by Google.
- Niles, John Milton (Bedford, Mass.: Applewood Books, 1830) *The Life of Oliver Hazard Perry*.
- Reid, George. (1913) *Perry at Erie:how Captain Dobbins, Benjamin Fleming and others assisted him.* (Erie, Pennsylvania: Journal publishing company).
- Skaggs, David Curtis; Altoff, Gerard T. Alton A *Signal Victory: The Lake Erie Campaign, 1812–1813* (Naval Institute Press), winner John Lyman Book Awards 1997. ISBN 978-1-55750-892-8.
- Skaggs, David Curtis; Welsh, William Jeffrey, editors (1991). *War on the Great Lakes: Essays Commemorating the 175th Anniversary of the Battle of Lake Erie*. Kent State University Press. Retrieved May 24, 2012.
- Skaggs, David Curtis. *Perry Triumphant* (April 2009 Volume 23, Number 2) Naval History Magazine United States Naval Institute.
- White, James T. (1895) p. 288. National Cyclopaedia of American Biography.
- “Log of the Battle of Lake Erie” by Sailing Master William Taylor.
- US Brig *Niagara*
- Commodore Perry I.P.A. and Tasting guide, Commodore Perry India Pale Ale by Great Lakes Brewing Co.
- Bloom, Loren (2008). “Information about the epic battle painting by Julian O. Davidson” . *The Battle of Lake Erie: Julian Oliver Davidson's Painting*. Erie Maritime Museum. Retrieved August 25, 2011.
- Perry Monument, Buffalo Historical Markers and Monuments website.
- Oliver Hazard Perry at *Find a Grave*
- Oliver Hazard Perry at Rootsweb.
- Correspondence of Oliver Hazard Perry at Dartmouth Digital Library

## 1.3 Frigate

This article is about the warship. For the bird, see Frigate bird.

A **frigate** /'frɪgɪt/ is any of several types of warship, the



*The Portuguese sailing frigate Dom Fernando II e Gloria in 1878*

term having been used for ships of various sizes and roles over the last few centuries.

In the 17th century, this term was used for any warship built for speed and maneuverability, the description often used being “frigate-built”. These could be warships carrying their principal batteries of carriage-mounted guns on a single deck or on two decks (with further smaller carriage-mounted guns usually carried on the forecastle and quarterdeck of the vessel). The term was generally used for ships too small to stand in the line of battle, although early line-of-battle ships were frequently referred to as frigates when they were built for speed.

In the 18th century, the term referred to ships that were usually as long as a ship of the line and were square-rigged on all three masts (full rigged), but were faster and with

### 1.2.14 External links

- **Bibliography** Paullin, Charles Edward (October 1918). *The Battle of Lake Erie* (a collection of documents, mainly those by Oliver Hazard Perry). Cleveland, Ohio: The Raufin Club. Retrieved August 18, 2011..
- Perry @ the National Park Service.
- Perry @ the Naval Historical Center.
- Perry's account of the Battle of Lake Erie (See Further reading, Paullin, supra.)
- The Oliver Hazard Perry papers William L. Clements Library.



The modern air-defence and command frigate *HNLMS Evertsen*

lighter armament, used for patrolling and escort. In the definition adopted by the British Admiralty, they were rated ships of at least 28 guns, carrying their principal armaments upon a single continuous deck —the upper deck—while ships of the line possessed two or more continuous decks bearing batteries of guns.

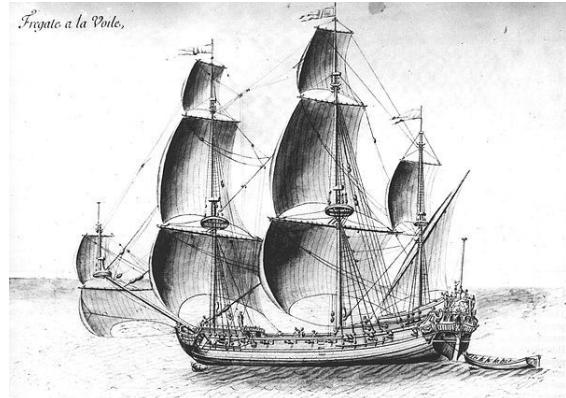
In the late 19th century (beginning about 1858 with the construction of prototypes by the British and French navies), the **armoured frigate** was a type of ironclad warship that for a time was the most powerful type of vessel afloat. The term “frigate” was used because such ships still mounted their principal armaments on a single continuous upper deck. The later 19th-century battleship thus developed from the frigate rather than from the ship of the line.

In modern navies, frigates are used to protect other warships and merchant-marine ships, especially as anti-submarine warfare (ASW) combatants for amphibious expeditionary forces, underway replenishment groups, and merchant convoys. Ship classes dubbed “frigates” have also more closely resembled corvettes, destroyers, cruisers, and even battleships. The rank “frigate captain” derives from the name of this type of ship.

### 1.3.1 Age of sail

#### Origins

The term “frigate” (Italian: *fregata*; Spanish/Catalan/Portuguese/Sicilian: *fragata*; Dutch: *fregat*; French: *frégate*) originated in the Mediterranean in the late 15th century, referring to a lighter galleass type ship with oars, sails and a light armament, built for speed and maneuverability.\*[1] The etymology of the word is unknown, although it may have originated as a corruption of *aphractus*, a Latin word for an open vessel with no lower deck. *Aphractus* was, in turn, derived from the Ancient Greek phrase ἀφράκτος ναῦς (*aphraktos naus*), or “undefended ship” .



Light frigate, circa 1675–1680

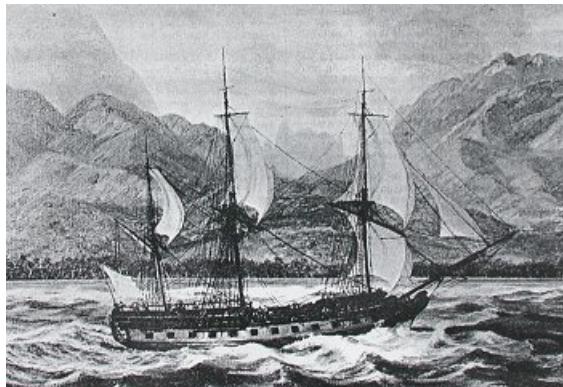
In 1583, during the Eighty Years' War, Habsburg Spain recovered the Southern Netherlands from the rebellious Dutch. This soon led to the occupied ports being used as bases for **privateers**, the **Dunkirkers**, to attack the shipping of the Dutch and their allies. To achieve this they developed small, maneuverable, sail-only vessels that came to be referred to as frigates. The success of these Dunkirker vessels influenced the ship design of the Dutch and other navies contending with them but because most regular navies required ships of greater endurance than the Dunkirker frigates could provide, the term was soon applied less exclusively to any relatively fast and elegant sail-only war ship. In French, the term “frigate” became a verb, meaning ‘to build long and low’, and an adjective, adding further confusion. Even the huge English *Sovereign of the Seas* could be described as “a delicate frigate” by a contemporary after her upper decks were reduced in 1651.\*[2]

The navy of the Dutch Republic was the first navy to build the larger ocean-going frigates. The Dutch navy had three principal tasks in the struggle against Spain: to protect Dutch merchant ships at sea, to blockade the ports of Spanish-held Flanders to damage trade and halt enemy privateering, and to fight the Spanish fleet and prevent troop landings. The first two tasks required speed, shallowness of draft for the shallow waters around the Netherlands, and the ability to carry sufficient supplies to maintain a blockade. The third task required heavy armament, sufficient to fight against the Spanish fleet. The first of these larger battle-capable frigates were built around 1600 at Hoorn in Holland.\*[3] By the later stages of the Eighty Years War the Dutch had switched entirely from the heavier ships still used by the English and Spanish to the lighter frigates, carrying around 40 guns and weighing around 300 tons.

The effectiveness of the Dutch frigates became most visible in the Battle of the Downs in 1639, encouraging most other navies, especially the English, to adopt similar designs.

The fleets built by the Commonwealth of England in the 1650s generally consisted of ships described as “frigates”

, the largest of which were two-decker 'great frigates' of the third rate. Carrying 60 guns, these vessels were as big and capable as 'great ships' of the time; however, most other frigates at the time were used as 'cruisers': independent fast ships. The term "frigate" implied a long hull design, which relates directly to speed (see [hull speed](#)) and also, in turn, helped the development of the broadside tactic in naval warfare.



Boudeuse, of Louis Antoine de Bougainville

At this time, a further design evolved, reintroducing oars to create the galley frigate such as [HMS Charles Galley](#) of 1676 which was rated as a 32-gun fifth rate but also had a bank of 40 oars set below the upper deck which could be used to propel the ship in the absence of a favourable wind.

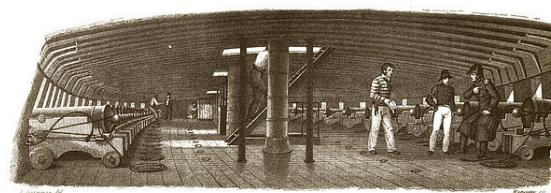
In Danish, the word "fregat" is often applied to warships carrying as few as 16 guns, such as [HMS Falcon](#) which the British classified as a sloop.

Under the rating system of the Royal Navy, by the middle of the 18th century, the term "frigate" was technically restricted to single-decked ships of the fifth rate, though small 28-gun frigates were classed as sixth rate.\*[1]

### Classic design



A Magicienne-class frigate



Gun deck of the Pallas-class frigate Méduse

The classic sailing frigate, well-known today for its role in the Napoleonic wars, can be traced back to French developments in the second quarter of the 18th century. The French-built *Médée* of 1740 is often regarded as the first example of this type. These ships were square-rigged and carried all their main guns on a single continuous upper deck. The lower deck, known as the "gun deck", now carried no armament, and functioned as a "berth deck" where the crew lived, and was in fact placed below the waterline of the new frigates.\*[4]

A total of fifty-nine French sailing frigates were built between 1777 and 1790, with a standard design averaging a hull length of 135 ft (41 m) and an average draught of 13 ft (4.0 m). The new frigates recorded sailing speeds of up to 14 knots (26 km/h; 16 mph), significantly faster than their predecessor vessels.\*[4] They were able to fight with all their guns when the seas were so rough that comparable two-deckers had to close the gun-ports on their lower decks (see the [Action of 13 January 1797](#), for an example when this was decisive). Like the larger 74 which was developed at the same time, the new frigates sailed well and were good fighting vessels due to a combination of long hulls and low upperworks compared to vessels of comparable size and firepower.

The Royal Navy captured a handful of the new French frigates during the [War of the Austrian Succession](#) (1740–1748) and were impressed by them, particularly for their inshore handling capabilities. They soon built copies and started to adapt the type to their own needs, setting the standard for other frigates as the leading naval power. The first British frigates carried 28 guns including an upper deck battery of twenty-four 9-pounder guns (the remaining four smaller guns were carried on the quarter deck) but soon developed into fifth-rate ships of 32 or 36 guns including an upper deck battery of twenty-six 12-pounder guns, with the remaining six or ten smaller guns carried on the quarter deck and forecastle. From around 1778, a larger "heavy" frigate was developed with a main battery of twenty-six or twenty-eight 18-pounder guns (again with the remaining ten smaller guns carried on the quarter deck and forecastle).

Both British and American frigates could (and usually did) additionally carry smaller carriage-mounted guns on their quarter decks and [forecastles](#) (the superstructures above the upper deck). Technically, rated ships with fewer than 28 guns could not be classed as frigates but as "post ships"; however, in common parlance most post

ships were often described as “frigates”, the same casual misuse of the term being extended to smaller two-decked ships that were too small to stand in the line of battle.

Royal Navy frigates of the late 18th century included the 1780-vintage *Perseverance* class, which measured around 900 tons burthen and carried 36 guns; this successful class was followed by numerous other classes that measured over 1,000 tons burthen and carried 38 guns.

### Heavy frigates



*USS Constitution*

In 1797, three of the United States Navy's first six major ships were rated as 44-gun frigates (or “super-frigates”), which operationally carried fifty-six to sixty 24-pounder long guns and 32-pounder or 42-pounder carronades on two decks; by all regards they were exceptionally powerful and tough. These ships were so well-armed that they were often regarded as equal to ships of the line, and after a series of losses at the outbreak of the War of 1812, Royal Navy fighting instructions ordered British frigates (usually of 38 guns or less) to never engage American frigates at any less than a 2:1 advantage. *USS Constitution*, preserved as a museum ship by the US Navy, is the oldest commissioned warship afloat, and is a surviving example of a frigate from the Age of Sail. *Constitution* and her sister ships *President* and *United States* were created in a response to deal with the Barbary Coast pirates and in conjunction with the Naval Act of 1794. The three big frigates, when built, had a distinctive building pattern which minimised “hogging” (in which the centre of the keel rises while both ends drop) and improves hydrodynamic efficiency.\*[5]

The hull was designed so that all the weight from the guns was upon the keel itself. Joshua Humphreys proposed that only live oak, a tree that grew only in America, should be used to build these ships. The method was to use diagonal riders, eight on each side that sat at a 45 degree

angle. These beams of live oak were about two feet wide and around a foot thick and helped to maintain the shape of the hull, serving also to reduce flexibility and to minimize impacts.\*[5] These ideas were considered revolutionary in the late 18th and early 19th century. A three-layer method was used in which the planks along the sides of the hull were laid horizontally across the ribs, making a crossing or checker board pattern. The sides of the ship could be as thick as 25 inches, and were able to absorb substantial damage. The strength of this braced construction earned *USS Constitution* the nickname “Old Iron-sides” .

### Role



*The fictitious, but representative, ironclad frigate USS Abraham Lincoln, from Jules Verne's novel Twenty Thousand Leagues Under the Sea*

Frigates were perhaps the hardest-worked of warship types during the Age of Sail. While smaller than a ship-of-the-line, they were formidable opponents for the large numbers of sloops and gunboats, not to mention privateers or merchantmen. Able to carry six months' stores, they had very long range; and vessels larger than frigates were considered too valuable to operate independently.

Frigates scouted for the fleet, went on commerce-raiding missions and patrols, and conveyed messages and dignitaries. Usually, frigates would fight in small numbers or singly against other frigates. They would avoid contact with ships-of-the-line; even in the midst of a fleet engagement it was bad etiquette for a ship of the line to fire on an

enemy frigate which had not fired first.\* [6] Frigates were involved in fleet battles, often as “repeating frigates”. In the smoke and confusion of battle, signals made by the fleet commander, whose flagship might be in the thick of the fighting, might be missed by the other ships of the fleet.\* [7] Frigates were therefore stationed to windward or leeward of the main line of battle, and had to maintain a clear line of sight to the commander's flagship. Signals from the flagship were then repeated by the frigates, which themselves standing out of the line and clear from the smoke and disorder of battle, could be more easily seen by the other ships of the fleet.\* [7] If damage or loss of masts prevented the flagship from making clear conventional signals, the repeating frigates could interpret them and hoist their own in the correct manner, passing on the commander's instructions clearly.\* [7]

For officers in the Royal Navy, a frigate was a desirable posting. Frigates often saw action, which meant a greater chance of glory, promotion, and prize money.

Unlike larger ships that were placed in ordinary, frigates were kept in service in peacetime as a cost-saving measure and to provide experience to frigate captains and officers which would be useful in wartime. Frigates could also carry marines for boarding enemy ships or for operations on shore; in 1832, the frigate *USS Potomac* landed a party of 282 sailors and Marines ashore in the US Navy's first Sumatran expedition.

Common armament was one gundeck with 24–30 long guns, from 8- to 24-pounders (3.6 to 11 kg), with up to a dozen light guns or caronades on the quarterdeck and forecastle above.

Frigates remained a crucial element of navies until the mid-19th century. The first ironclads were classified as “frigates” because of the number of guns they carried. However, terminology changed as iron and steam became the norm, and the role of the frigate was assumed first by the protected cruiser and then by the light cruiser.

Frigates are often the vessel of choice in historical naval novels due to their relative freedom compared to ships of the line (kept for fleet actions) and smaller vessels (generally assigned to a home port and less widely ranging). For example, the Patrick O'Brian Aubrey–Maturin series, C. S. Forester's Horatio Hornblower series and Alexander Kent's Richard Bolitho series. The motion picture *Master and Commander: The Far Side of the World* features a reconstructed historic frigate, *HMS Rose*, to depict Aubrey's frigate *HMS Surprise*.

### Preservation and replication

- Two British sailing frigates, both of the *Leda* class, are preserved, *HMS Trincomalee* in Hartlepool and *HMS Unicorn* in Dundee.
- On display in Boston (and still a commissioned U.S. Navy vessel), is *USS Constitution*. Launched in

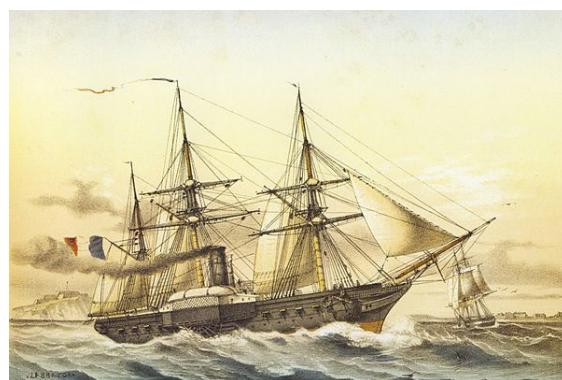
1797, she is one of the original six frigates of the United States Navy. As a commissioned USN vessel, she is afloat and maintained in superb condition by her crew.

- The Portuguese frigate *Dom Fernando II e Gloria* is preserved as a museum ship, presently being on display in Almada. Launched in 1843, it was the last Portuguese sailing warship to be built.
- In 1997, a project to rebuild a famous French frigate was able to lay the keel in a dry dock in Rochefort. The frigate *Hermione* was the ship that carried Lafayette to the U.S. during the American revolutionary war. The original *Hermione* was sunk in 1793 off the French coast, and her wreck was rediscovered in 1992. Fortunately, the British had captured her sister ship in the Napoleonic wars and had recorded her construction in great detail, which documents were then available for the reconstruction. The replica is faithful in almost every way to the original. The ship is 56 metres (184 ft) long and carries twenty-six 12-pounder guns. The project site contains many very interesting photos of her construction; a site for the book to accompany her build and launch (in English) gives some summary details.
- Replica frigates have been used in a number of films: these include *Grand Turk*, playing “HMS Indefatigable” in the 1999 Ioan Gruffudd TV Series *Hornblower*; also replica frigate *HMS Rose* playing “HMS Surprise” in the 2003 Russell Crowe film *Master and Commander*, and also “HMS Providence” in the 2011 Johnny Depp film *Pirates of the Caribbean: On Stranger Tides*.

### 1.3.2 Age of steam

Main article: Steam frigate

Vessels classed as frigates continued to play a great role in



French paddle frigate Descartes

navies with the adoption of steam power in the 19th century. In the 1830s, navies experimented with large paddle

steamers equipped with large guns mounted on one deck, which were termed "paddle frigates".

From the mid-1840s on, frigates which more closely resembled the traditional sailing frigate were built with steam engines and screw propellers. These "screw frigates", built first of wood and later of iron, continued to perform the traditional role of the frigate until late in the 19th century.

### Armoured frigate

From 1859, armour was added to ships based on existing frigate and ship of the line designs. The additional weight of the armour on these first ironclad warships meant that they could have only one gun deck, and they were technically frigates, even though they were more powerful than existing ships-of-the-line and occupied the same strategic role. The phrase "armoured frigate" remained in use for some time to denote a sail-equipped, broadside-firing type of ironclad.

After 1875, the term "frigate" fell out of use. Vessels with armoured sides were designated as "battleships" or "armoured cruisers", while "protected cruisers" only possessed an armoured deck, and unarmoured vessels, including frigates and sloops, were classified as "unprotected cruisers".

### In preservation

- On display in Portsmouth is HMS *Warrior*, built in 1860. *Warrior*, constructed of wrought iron, was the world's first iron-hulled, armoured warship powered by steam as well as sail. She and her sister ship, HMS *Black Prince*, were the sole members of the *Warrior* class ironclads: Queen Victoria's "Black Battle Fleet." *Warrior* was used for 50 years as an oil jetty at Milford Haven before being restored to her former glory.
- On display in Ebeltoft, Denmark is the Danish steam frigate *Jylland* launched in 1860.

### 1.3.3 Second World War

Modern frigates are related to earlier frigates only by name. The term "frigate" was readopted during the Second World War by the British Royal Navy to describe an anti-submarine escort vessel that was larger than a corvette, smaller than a destroyer, and about equal in size and capability to the American destroyer escort. Anti-submarine escorts had previously been classified as sloops by the Royal Navy, and the *Black Swan*-class sloops of 1939–1945 were as large as the new types of frigate, and more heavily armed. Twenty-two of these were reclassified as frigates after the war, as were the remaining 24 smaller *Castle*-class corvettes.



A *Loch*-class frigate



The U.S. Navy *Tacoma*-class patrol frigate *USS Gallup* at San Pedro, California, on 30 May 1944

The frigate was introduced to remedy some of the shortcomings inherent in the corvette design: limited armament, a hull form not suited to open-ocean work, a single shaft which limited speed and maneuverability, and a lack of range. The frigate was designed and built to the same mercantile construction standards (scantlings) as the corvette, allowing manufacture by yards unused to warship construction. The first frigates of the River class (1941) were essentially two sets of corvette machinery in one larger hull, armed with the latest Hedgehog anti-submarine weapon.

The frigate possessed less offensive firepower and speed than a destroyer, but such qualities were not required for anti-submarine warfare. Submarines were slow while submerged, and ASDIC sets did not operate effectively at speeds of over 20 knots (23 mph; 37 km/h). Rather, the frigate was an austere and weatherly vessel suitable for mass-construction and fitted with the latest innovations in anti-submarine warfare. As the frigate was intended purely for convoy duties, and not to deploy with the fleet, it had limited range and speed.

The contemporary German *Flottbegleiter* ("fleet escorts"), also known as "F-Boats", were essentially frigates.\*[8] They were based on a pre-war *Oberkommando der Marine* concept of vessels which could fill roles such as fast minesweeper, minelayer, merchant escort and anti-submarine vessel. Because of the Treaty of Versailles their displacement was officially lim-

ited to 600 tons, although in reality they exceeded this by about 100 tons. F-boats had two stacks and two 105 mm gun turrets. The design was flawed because of its narrow beam, sharp bow and unreliable high pressure steam turbines. F-boats were succeeded in operational duties by Type 35 and Elbing class torpedo boats. *Flottenbegleiter* remained in service as advanced training vessels.

It was not until the Royal Navy's Bay class of 1944 that a British design classified as a "frigate" was produced for fleet use, although it still suffered from limited speed. These anti-aircraft frigates, built on incomplete Loch-class frigate hulls, were similar to the United States Navy's destroyer escorts (DE), although the latter had greater speed and offensive armament to better suit them to fleet deployments. The destroyer escort concept came from design studies by the General Board of the United States Navy in 1940, as modified by requirements established by a British commission in 1941\*[9] prior to the American entry into the war, for deep-water escorts. The American-built destroyer escorts serving in the British Royal Navy were rated as Captain-class frigates. The U.S. Navy's two Canadian-built *Asheville*-class and 96 British-influenced, American-built *Tacoma*-class frigates that followed originally were classified as "patrol gunboats" (PG) in the U.S. Navy but on 15 April 1943 were all reclassified as **patrol frigates (PF)**.

#### In preservation and in fiction

- On display in Brisbane, Australia is HMAS *Diamondina*, the last complete River-class frigate, preserved at the Queensland Maritime Museum.
- The River-class frigate HMCS *Stormont* served as a convoy escort during the Battle of the Atlantic and was present at the D-Day landings.\*[10] In 1947, Greek shipowner Aristotle Onassis purchased her for scrap value and converted her into a luxurious superyacht named *Christina O*, after his daughter. The vessel is now owned by John Paul Nicolaou, who lets the yacht for elite charters and cruises.
- "HMS Saltash" was a fictional River-class frigate in Nicholas Monsarrat's 1951 book: *The Cruel Sea*. (In the 1953 Jack Hawkins film version she is called "HMS Saltash Castle", and was played by the corvette HMS *Portchester Castle*).
- HMCS *New Glasgow* plays the fictional frigate "HMS Rockhampton" in the 1955 John Wayne film *The Sea Chase*. (She had just been recommissioned as a *Prestonian*-class upgrade of the Canadian River-class frigates, after ten years in reserve).
- "HMS Troutbridge" was the fictional RN Frigate which was the weekly setting for the BBC Radio comedy programme *The Navy Lark* which ran on

the BBC's Light Programme (subsequently Radio 2) from 1959 to 1977.

Moored on the Thames Embankment in London are two surviving Royal Navy anti-submarine sloops, which are the predecessors of the Second World War frigates:

- HMS *President*, built as HMS *Saxifrage* in 1918, is a Flower-class anti-submarine Q-Ship, and is one of the last three surviving warships of the Royal Navy built during the First World War. *President* was one of the first types of warship built specifically for anti-submarine warfare.
- HMS *Wellington* (U65), a 1930 *Grimsby*-class sloop, is moored nearby, and represents the subsequent type of anti-submarine vessel. These were the precursors of the *Black Swan*-class sloops of 1939, later re-classified as frigates. *Wellington* and *President* together represent the first and second generation ancestors of modern frigates, which are the most numerous type of front-line warship in today's navy.

#### 1.3.4 Contemporary

##### Guided-missile role



Royal Canadian Navy Halifax-class frigate HMCS *Regina* escorting the American aircraft carrier USS *Kitty Hawk* across the Pacific Ocean in 2008

The introduction of the surface-to-air missile after the Second World War made relatively small ships effective for anti-aircraft warfare: the "guided missile frigate." In the USN, these vessels were called "ocean escorts" and designated "DE" or "DEG" until 1975 – a holdover from the Second World War destroyer escort or "DE". The Royal Canadian Navy and British Royal Navy maintained the use of the term "frigate"; likewise, the French Navy refers to missile-equipped ship, up to cruiser-sized ships, by the name of "frégate", while smaller units are named *aviso*. The Soviet Navy used the term "guardship" (*сторожевой корабль*).



The Ecuadorian Navy Leander-class frigate BAE Morán Valverde, formerly the Chilean Navy's Almirante Lynch



USS Leahy departing San Diego, California, in May 1978. She was classified as a guided-missile frigate (DLG-16) until 1975, when she was reclassified as a guided-missile cruiser (CG-16).

From the 1950s to the 1970s, the United States Navy commissioned ships classed as guided missile frigates which were actually anti-aircraft warfare cruisers built on destroyer-style hulls. Some of these ships—the *Bainbridge*, *Truxtun*, *California* and *Virginia* classes—were nuclear-powered. These “frigates” were roughly mid-way in size between cruisers and destroyers. This was similar to the use of the term “frigate” during the age of sail during which it referred to a medium-sized warship, but it was inconsistent with conventions used by other contemporary navies which regarded frigates as being smaller than destroyers. During the 1975 ship reclassification, the large American frigates were redesignated as cruisers or destroyers, while ocean escorts (the American classification for ships smaller than destroyers) were renamed as frigates. It was in the late 1970s that the US Navy introduced the 51-ship *Oliver Hazard Perry*-class guided missile frigates (FFG), the last of which was decommissioned in 2015.

One of the most successful post-1945 designs was the British *Leander*-class frigate, which was used by several navies. Laid down in 1959, the *Leanders* were based on the previous Type 12 anti-submarine frigate but equipped

for anti-aircraft use as well. They were used by the UK into the 1990s, at which point some were sold onto other navies. The *Leander* design, or improved versions of it, were licence-built for other navies.

Nearly all modern frigates are equipped with some form of offensive or defensive missiles, and as such are rated as guided-missile frigates (FFG). Improvements in surface-to-air missiles (e.g., the Eurosam Aster 15) allow modern guided-missile frigates to form the core of many modern navies and to be used as a fleet defence platform, without the need for specialised anti-air warfare frigates.

## Other uses

The Royal Navy Type 61 *Salisbury* class were “air direction” frigates equipped to track aircraft. To this end they had reduced armament compared to the Type 41 *Leopard*-class air-defence frigates built on the same hull.

Multi-role frigates like the MEKO 200, *Anzac* and *Halifax* classes are designed for navies needing warships deployed in a variety of situations that a general frigate class would not be able to fulfill and not requiring the need for deploying destroyers.

## Anti-submarine role



HMS Somerset of the Royal Navy. Type 23 frigates were built for anti-submarine warfare but are capable multi-purpose ships. [11]

At the opposite end of the spectrum, some frigates are specialised for anti-submarine warfare. Increasing submarine speeds towards the end of the Second World War (see German Type XXI submarine) greatly reduced the margin of speed superiority of frigate over submarine. The frigate could no longer be slow and powered by mercantile machinery and consequently postwar frigates, such as the *Whitby* class, were faster.

Such ships carry improved sonar equipment, such as the variable depth sonar or towed array, and specialised weapons such as torpedoes, forward-throwing weapons

such as **Limbo** and missile-carried anti-submarine torpedoes such as **ASROC** or **Ikara**. Surface-to-air missiles such as **Sea Sparrow** and surface-to-surface missiles such as **Exocet** give them defensive and offensive capabilities. The Royal Navy's original **Type 22 frigate** is an example of a specialised anti-submarine warfare frigate.

Especially for anti-submarine warfare, most modern frigates have a **landing deck** and **hangar** aft to operate **helicopters**, eliminating the need for the frigate to close with unknown sub-surface threats, and using fast helicopters to attack nuclear submarines which may be faster than surface warships. For this task the helicopter is equipped with sensors such as **sonobuoys**, wire-mounted dipping sonar and **magnetic anomaly detectors** to identify possible threats, and torpedoes or depth-charges to attack them.

With their onboard radar helicopters can also be used to reconnoitre over-the-horizon targets and, if equipped with **anti-ship missiles** such as **Penguin** or **Sea Skua**, to attack them. The helicopter is also invaluable for **search and rescue** operation and has largely replaced the use of small boats or the **jackstay rig** for such duties as transferring personnel, mail and cargo between ships or to shore. With helicopters these tasks can be accomplished faster and less dangerously, and without the need for the frigate to slow down or change course.

### Further developments



*The stealthy Shivalik-class frigate of the Indian Navy*

Stealth technology has been introduced in modern frigate design. Frigate shapes are designed to offer a minimal radar cross section, which also lends them good air penetration; the maneuverability of these frigates has been compared to that of sailing ships. Examples are the French **La Fayette** class with the **Aster 15** missile for anti-missile capabilities, the German **F125** and **Sachsen**-class frigates, the Turkish **TF2000** type frigates with the **MK-41 VLS**, and the Indian **Shivalik** and **Talwar** classes with the **Brahmos** missile system.

The modern French Navy applies the term first-class frigate and second-class frigate to both destroyers and frigates in service. Pennant numbers remain divided be-



*The stealthy Admiral Gorshkov-class frigate of the Russian Navy*

tween F-series numbers for those ships internationally recognised as frigates and D-series pennant numbers for those more traditionally recognised as destroyers. This can result in some confusion as certain classes are referred to as frigates in French service while similar ships in other navies are referred to as destroyers. This also results in some recent classes of French ships being among the largest in the world to carry the rating of frigate.

In the **German Navy**, frigates were used to replace aging destroyers; however in size and role the new German frigates exceed the former class of destroyers. The future German **F125**-class frigate will be the largest class of frigates worldwide with a displacement of more than 7,200 tons. The same was done in the **Spanish Navy**, which went ahead with the deployment of the first Aegis frigates, the **Álvaro de Bazán**-class frigates.

### Littoral Combat Ship (LCS)



*USS Independence, an Independence-class littoral combat ship of the United States Navy*

Some new classes of ships similar to **corvettes** are optimized for high-speed deployment and combat with small craft rather than combat between equal opponents; an example is the U.S. **Littoral Combat Ship** (LCS). As of mid-2015, all **Oliver Hazard Perry**-class frigates in the United States Navy were to decommissioned, and their role partially being assumed by the new LCS. While the

LCS class ships are smaller than the frigate class they will replace, they offer a similar degree of weaponry while requiring less than half the crew complement and offering a top speed of over 40 knots (74 km/h; 46 mph). A major advantage for the LCS ships is that they are designed around specific mission modules allowing them to fulfill a variety of roles. The modular system also allows for most upgrades to be performed ashore and installed later into the ship, keeping the ships available for deployment for the maximum time.

The latest U.S. deactivation plans will retire all *Oliver Hazard Perry*-class frigates by October 2015, which will be the first time that the U.S. Navy has been without a frigate class of ships since 1943 (technically *USS Constitution* is rated as a frigate and is still in commission, but does not count towards Navy force levels).<sup>\*[12]</sup>

The remaining 20 LCSs to be acquired from 2019 and onwards that will be enhanced will be designated as frigates, and existing ships given modifications may also have their classification changed to *FF* as well.<sup>\*[13]</sup>

### 1.3.5 See also

- List of frigate classes
- List of frigate classes by country
- United States Navy 1975 ship reclassification

#### Lists

Main article: List of frigate classes by country

Note that Algerian, Tripolitan and Tunisian sail frigates are listed under Turkey. All Italian city-state frigates are listed under Italy.

### 1.3.6 References

#### Notes

- [1] Henderson, James: *Frigates Sloops & Brigs*. Pen & Sword Books, London, 2005. ISBN 1-84415-301-0.
- [2] Rodger (2004) p. 216
- [3] Geofrrey Parker, *The Military Revolution: Military Innovation and the Rise of the West 1500–1800*, p. 99
- [4] Breen, Colin; Forsythe, Wes (2007). “The French Shipwreck La Survillante, Lost in Bantry Bay, Ireland, in 1797”. *Historical Archaeology* (Society for Historical Archaeology) 41 (3): 41–42. Retrieved 11 September 2014. (subscription required (help)).
- [5] Archibald, Roger. 1997. Six ships that shook the world. American Heritage of Invention & Technology 13, (2): 24.

- [6] Lavery, Brian (1989). *Nelson's Navy: The Ships, Men and Organisation 1793–1815*. Annapolis: Naval Institute Press. pp. 49, 298–300. ISBN 1-59114-611-9.
- [7] *Encyclopædia Britannica* 17. p. 469.
- [8] prinzeugen.com “Frigate: An Online Photo Album” . Retrieved on: 11 February 2008.
- [9] Gardiner, Robert, ed., *Conway's All the World's Fighting Ships, 1922–1946*, New York: Mayflower Books, 1980, ISBN 0-8317-0303-2, p. 149.
- [10] “Canadian Participation on D-Day and In The Battle of Normandy” . *National Defence and the Canadian Forces*. 7 June 2010.
- [11] <http://www.royalnavy.mod.uk/operations-and-support/surface-fleet/type-23-frigates/> Type 23 frigates at the Royal Navy website
- [12] Larter, David (2 July 2014). “Decommissioning plan pulls all frigates from fleet by end of FY '15” . *Military-times.com*. Retrieved 25 July 2015.
- [13] SNA: Modified Littoral Combat Ships to be Designated Frigates – News.USNI.org, 15 January 2015

#### Bibliography

- Bennett, G. (2001) *The Battle of Trafalgar*, Barnsley (2004). ISBN 1-84415-107-7
- Constam, Angus & Bryan, Tony, British Napoleonic Ship-Of-The-Line, Osprey Publishing, 184176308X
- Gardiner, Robert & Lambert, Andrew, (Editors), (2001) *Steam, Steel and Shellfire: The Steam Warship, 1815–1905* (Conway's History of the Ship series), Book Sales,
- Gresham, John D. “The swift and sure steeds of the fighting sail fleet were its dashing frigates”, *Military Heritage* magazine, (John D. Gresham, Military Heritage, February 2002, Volume 3, No.4, pp. 12 to 17 and p. 87).
- Rodger, N. A. M. *The Command of the Ocean, a Naval History of Britain 1649–1815*, London (2004). ISBN 0-7139-9411-8
- Lambert, Andrew (1984) *Battleships in Transition, the Creation of the Steam Battlefleet 1815–1860*, published Conway Maritime Press, . ISBN 0-85177-315-X
- Lavery, Brian (1989) *Nelson's Navy: The Ships, Men and Organisation 1793–1815*. Annapolis, Md.: Naval Institute Press, . ISBN 1-59114-611-9.
- Lavery, Brian (1983) *The Ship of the Line, Volume 1: The Development of the Battlefleet, 1650–1850*. Annapolis, Md.: Naval Institute Press, ISBN 0-87021-631-7.

- Lavery, Brian. (1984) *The Ship of the Line, Volume 2: Design, Construction and Fittings*. Annapolis, Md.: Naval Institute Press, ISBN 0-87021-953-7.
- Mahan, A.T., (2007) *The Influence of Sea Power Upon History 1660–1783*, Cosimo, Inc.,
- Marriott, Leo. *Royal Navy Frigates 1945–1983*, Ian Allan, 1983, ISBN 0-7110-1322-5
- Macfarquhar, Colin & Gleig, George (eds.), ((1797)) *Encyclopædia Britannica: Or, A Dictionary of Arts, Sciences, and Miscellaneous Literature*, London, Volume 17, Third Edition.
- Rodger, N.A.M. ((2004)) *The Command of the Ocean, a Naval History of Britain 1649–1815*, London . ISBN 0-7139-9411-8
- Sondhaus, L. *Naval Warfare, 1815–1914*
- Winfield, Rif. (1997) *The 50-Gun Ship*. London: Caxton Editions, ISBN 1-84067-365-6, ISBN 1-86176-025-6
- Lavery, B. (2004) *Ship*, Dorling Kindersly, Ltd . ISBN 1-4053-1154-1

### 1.3.7 External links

- Frigates from battleships-cruisers.co.uk – history and pictures of United Kingdom frigates since World War II
- Frigates from Destroyers OnLine – pictures, history, crews of United States frigates since 1963
- The Development of the Full-Rigged Ship From the Carrack to the Full-Rigger

## Chapter 2

# United States Navy

### 2.1 USS Oliver Hazard Perry (FFG-7)

For other ships of the same name, see [USS Perry](#).

**USS Oliver Hazard Perry (FFG-7)**, lead ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Oliver Hazard Perry, American naval hero, who was victorious at the 1813 [Battle of Lake Erie](#). *Oliver Hazard Perry* (FFG-7) was the first ship and, as of 2015, the only ship of that name in the U.S. Navy. *Oliver Hazard Perry* was in service from 1977 to 1997 and was scrapped in 2005.

The class was originally intended as austere 'low' category guided missile frigates (compared with the high capability *Spruance* class) for General Purpose and Anti-Air convoy escort. They were built under a cloud of controversy, with their very light gun armament and lack of redundancy and duplicated systems in event of ship being hit. They were regarded by the Reagan administration and Secretary [John Lehman](#) as not part of the 500 ship navy plan, but ultimately proved useful as anti-submarine ships if fitted to carry [Seahawks](#) and towed arrays and in the 21C as low grade patrol ships making up the numbers in a USN desperately short of escorts.

#### 2.1.1 History

*Oliver Hazard Perry* was ordered from Bath Iron Works on 30 October 1973 as part of the FY73 program, and was laid down on 12 June 1975, launched on 25 September 1976, and commissioned on 17 December 1977.<sup>\*[1]</sup> She was ordered as **PFG-109** but was redesignated as **FFG-7** in the 1975 fleet designation realignment on 1 June 1975, before she was laid down.

#### Launch incident

During her launch ceremony on 25 September 1976, the ship found herself briefly stuck on the slip-way. Film star John Wayne appeared from the crowd of watching dignitaries, climbed the launch ceremony platform, and gave

the bow of the frigate – which was by this time starting to move slightly – a shove with one hand, and so John Wayne famously appeared to have 'pushed' a US warship down her slip-way.<sup>\*[2]</sup>

#### Shock Trial Testing

*Oliver Hazard Perry* was one of the few lead ships to be subjected to shock trials. These series of trials conducted early in the life of the ship put this steel hull / aluminum superstructure to the test. The proximity of the tests (seen in associated pictures), caused many of the machine mounts and components to become warped or damaged. This damage created alignment problems for the engineering and combat systems teams in the years to come. The ship regularly required waivers on machine performance due to the warping of many mounting brackets. However, this did not affect the overall readiness of the ship, nor did it prevent *Oliver Hazard Perry* from achieving the record for the most-ever hours put on the GE LM2500 Main Propulsion engine.<sup>\*[3]</sup>

#### Fate

After 19.2 years of active service, *Oliver Hazard Perry* was decommissioned on 20 February 1997,<sup>\*[1]</sup> in Mayport, FL under the last Commanding Officer, CDR Robert F. Holman, USNR. Though she was stricken on 3 May 1999, *Oliver Hazard Perry* was held in the museum donation category at the former Navy shipyard in Philadelphia, Pennsylvania. A group had hoped to bring her to Toledo, Ohio and display her as a museum ship and a remembrance for the [Battle of Lake Erie](#). The group could not get a financial plan together in time, and so *Perry* was sold for scrap in December 2005.

#### 2.1.2 Commanders

- Cmdr. Steven James Duich (17 Dec. 1977 - 19 Dec. 1979)
- Cmdr. Howard Sanford Stoddard (19 Dec. 1979 - 28 Oct. 1981)

- Cmdr. Richard F. Beal (28 Oct. 1981 - 20 Jan. 1984)
- Cmdr. John F. Brunelli (20 Jan. 1984 - 21 Mar. 1986)
- Cmdr. Roger S. Cooper (21 Mar. 1986 - 10 Jun. 1988)
- Cmdr. Terry Dean Schechinger (10 Jun. 1988 - 05 Jul. 1990)
- Cmdr. Richard Patrick Lee (05 Jul. 1990- 22 Jul. 1992)
- Cmdr. Robert Alan Bullock (22 Jul. 1992 - 12 Apr. 1994)
- Cmdr. Ricky Lowell Carper (12 Apr. 1994 - 24 Feb. 1996)
- Cmdr. Robert Francis Holman (24 Feb. 1996 - 20 Dec. 1997)

### 2.1.3 References

- [1] “Oliver Hazard Perry” . [nvr.navy.mil](http://nvr.navy.mil).
- [2] All Star Party for John Wayne (1976)- Charles Bronson honors John Wayne!, YouTube (beginning 42 seconds into the clip)
- [3] US Navy OPPE Results, 1984 to 1989, US Navy archives

### 2.1.4 External links

- Photos of USS Oliver Hazard Perry (FFG 7)
- MaritimeQuest USS Oliver Hazard Perry FFG-7 pages
- NVR FFG-7
- Photo gallery of USS *Oliver Hazard Perry* (FFG-7) at NavSource Naval History

## 2.2 USS McInerney (FFG-8)

**USS McInerney (FFG-8)**, formally **PF-110**,<sup>\*[1]</sup> second ship of the *Oliver Hazard Perry* class of guided-missile frigates, is the first United States Navy ship named for Vice Admiral Francis X. McInerney (1899–1956). Ordered from Bath Iron Works on 27 February 1976 as part of the FY75 program, *McInerney* was laid down on 16 January 1978, launched on 4 November 1978, and commissioned on 15 December 1979.

*McInerney* remained in service until 31 August 2010, when the ship was decommissioned and transferred to the Pakistani Navy. After a major overhaul and refurbishment, the ship was renamed **PNS Alamgir (F260)**, and entered service in early 2011.

### 2.2.1 US Navy career

#### 1980s

*McInerney*'s mission was to provide multi-threat protection for military and merchant shipping, amphibious task forces and underway replenishment groups. During her first two years of service, *McInerney* was the U.S. Navy test platform for the LAMPS MK-III (**SH-60B** helicopter) anti-submarine warfare system and the Recovery Assist, Secure, and Traverse (RAST) system. Her efforts during this period earned her a **Meritorious Unit Commendation**. In 1981, *McInerney* appears to have been part of Destroyer Squadron 8.

*McInerney*'s first major deployment to the Mediterranean Sea and Indian Ocean began in November 1982. During this deployment she embarked a LAMPS Mk-I (**SH-2 Seasprite**) helicopter detachment. *McInerney* made brief port visits to Tangiers, Morocco, and Catania, Sicily and supported the Multi-National Force in **Beirut**, Lebanon (earning her the Navy Expeditionary Medal). After transiting the Suez Canal, *McInerney* operated in the Indian Ocean and made port calls to Karachi, Pakistan, Colombo, Sri Lanka, and Mombasa, Kenya. She also crossed the equator en route to **Diego Garcia**. Following this deployment, *McInerney* operated in the Caribbean and visited Port Limon, Costa Rica and Tela, Honduras. She received the **Coast Guard Meritorious Unit Citation** for her efforts in law enforcement during this period.

In October 1984, *McInerney* deployed again to the Middle East in the midst of the Iran/Iraq **Tanker War**. She had been fitted with the **Phalanx CIWS** and also carried a LAMPS Mk-I (**SH-2 Seasprite**) helicopter detachment. During this deployment she visited ports in Djibouti, United Arab Emirates, Saudi Arabia, Bahrain, Pakistan, and Palma, Spain. *McInerney* returned from this cruise in March 1985, and conducted law enforcement operations and other fleet exercises. In May 1986, *USS McInerney* began a 10-month-long overhaul (extended Selected Restricted Availability) in Boston, MA. During this yard period she received the **AN/SQQ-89(V)2** Anti-Submarine Warfare Suite, fin stabilizers, and the Single Audio System. The RAST equipment was also reinstalled and made operational.

In August 1988, *McInerney* was underway for her third deployment—this one to the Mediterranean. This deployment was highlighted by *McInerney* being awarded the **COMSIXTHFLT** “Hook 'Em” Award for excellence in Anti-Submarine Warfare and a **Meritorious Unit Commendation**. On the morning of 21 December, *McInerney* received a distress call from the **cement tanker Jenneastar**, southwest of Sardinia, Italy. The crew had abandoned the ship when she began to list 25 degrees to port and started taking on water in bad weather. Ten **Polish** and two **Ghanian** crewmen were rescued and transported to Naples, Italy.<sup>\*[3]</sup> *McInerney* returned from the Mediterranean in February 1989, and departed for the Northern

Atlantic in the spring of 1989. Anti-Submarine Warfare operations led *McInerney* above the Arctic Circle, and *McInerney* returned to Mayport in May 1989.

## 1990s

*McInerney* deployed to the Middle East in January 1991 and was awarded her second "Hook 'Em" Award after a brief ASW operation in the Mediterranean Sea. *McInerney* then entered the Persian Gulf in support of coalition forces against Iraq. *McInerney* performed in every warfare area during the conflict, including convoy escort, mine warfare, anti-air and anti-surface operations. *McInerney* earned the Navy Unit Commendation, the National Defense Service Medal, the Southwest Asia Service Medal with Bronze Star, the Kuwait Liberation Medal (Saudi Arabia) and the Kuwait Liberation Medal (Kuwait) for her wartime service.

The ship returned from the Middle East in July 1991 after escorting more than 50 merchant vessels through the mine-swept waters to Kuwait ports. Her continued, proven prowess earned her the Battle "E" for efficiency, and the COMNAVSURFLANT ASW Award, designating her as the top AN/SQQ-89-configured ASW platform on the East Coast. *McInerney*'s humanitarian efforts, throughout her career, include assisting the tug *Taurus* in the Jacksonville Operating Area, transferring a wounded merchant seaman during the Tanker War, rescuing sailors from the sinking motor vessel *Jenneastar* in the Mediterranean and escorting merchant ships carrying needed supplies to the ports of Kuwait through mine-swept channels in the aftermath of Operation Desert Storm.

In 1999, *McInerney* participated in the UNITAS 40-99 deployment to South America UNITAS along with *Samuel B. Roberts*.

## 2000s

*McInerney* completed a highly successful SOUTHCOM Counter-Drug Operations Deployment in November 2001. The highlight of the deployment was a drug bust of an Ecuadorian fishing vessel in which nearly 10 tons of cocaine were seized. For her efforts throughout the deployment, *McInerney* was awarded the Humanitarian Service Medal and the Coast Guard Meritorious Unit Commendation.

On 13 September 2008, *McInerney*, working with Coast Guard Law Enforcement Detachment 404, intercepted a 59-foot (18 m) self-propelled semisubmersible carrying seven tons of cocaine off the coast of Guatemala. Four Colombian drug smugglers were captured aboard. The cargo had an estimated street value of \$187 million.\*[4]\*[5]

On 5 October 2009, *McInerney* left Mayport Naval Station on its final deployment.\*[6]

On 3 April 2010, an MQ-8 Fire Scout from *McInerney* helped to confiscate 60 kilograms (130 lb) of cocaine from a speedboat.\*[7]

### 2.2.2 Transfer to Pakistan

In September 2008, the US Congress approved the transfer of the frigate to Pakistan, with a delivery date of August 2010.\*[8] Citing the Foreign Assistance Act and the Arms Export Control Act, Pakistan is considered a "major non-NATO ally", able to receive older unneeded US military equipment. *McInerney* was decommissioned on 31 August 2010.

The 32-year-old frigate, which was renamed *Alamgir*, was given a US\$65 million refurbishment, including anti-submarine capability paid for with foreign military aid money.\*[9]\*[10] *Alamgir* received an overhaul of almost all mechanical equipment, ranging from the overhaul of all four diesels, down to inspection and replacement of sea valves and air conditioning. A new bridge and navigational suite were installed, along with a VIP cabin and a composite dome over the overhauled AN/SQS-56 sonar array.

Pakistani personnel embarked during December 2010 and were trained to operate the vessel to the US Navy's Personnel Qualification Standard. Sea trials began in late January 2011. On 21 January, the ship collided with the pier during engine tests, resulting in damage to both ship and pier.\*[11] The goal was to sail *Alamgir* away on 10 February 2011.

### 2.2.3 Pakistani Navy career

On 24 March 2011, *Alamgir* docked in the British North Atlantic territory of Bermuda.\*[12]

On 18 February 2014, while operating off Oman's Masirah Island, *Alamgir* and the Australian frigate *Melbourne* intercepted and boarded a dhow found to be carrying 1,951 kilograms (4,301 lb) of cannabis resin.\*[13]

### 2.2.4 References

- [1] "USS McInerney (FFG 8)". Navysite.de. Retrieved April 10, 2015.
- [2] Meyer, Herman J. (1 March 1982). "USS MCINERNEY (FFG-8)" (PDF). 1981 Command History Report. p. 2. Retrieved June 27, 2015.
- [3] Borns, Michael O. (24 January 1989). "USS MCINERNEY (FFG 8)" (PDF). 1988 Command History Report. US Navy. p. 6. Retrieved June 27, 2015.
- [4] McCullough, Amy. "Sailors, Coasties nab cocaine-stuffed sub". *Navy Times*. 17 September 2008. Retrieved 17 September 2008.

- [5] Semi-Submersible
- [6] <http://www.news4jax.com/news/21202523/detail.html>
- [7] Fire Scout Scores First-Ever Drug Bust with USS McInerney *Navy.mil*, 7 April 2010. Retrieved 14 April 2010.
- [8] Bush okays anti-submarine frigate for Pak
- [9] U.S. to transfer frigate to Pakistan navy
- [10] Pakistan to get refurbished warship from US *Times of India*, 19 October 2008
- [11] Lewis, Jessika (22 January 2011). “Pakistani Ship Hits Pier Near Naval Station Mayport”. First Coast News. Retrieved June 27, 2015.
- [12] “Warship enters Bermudian waters” *Bermuda Sun*, Shipping, 25 March 2011
- [13] Rejimon, K (19 February 2014). “\$102m drugs seized from dhow off Oman coast”. *Times of Oman*. Retrieved 19 February 2014.

## 2.2.5 External links

- USS *McInerney* official website
- USS *McInerney* navsource.org
- USS *McInerney* (FFG-8) command histories – Naval History & Heritage Command
- 1979
- 1980
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2002
- 2004

## 2.3 USS Wadsworth (FFG-9)

For other ships of the same name, see [USS Wadsworth](#).

**USS Wadsworth (FFG-9)**, third ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Commodore Alexander S. Wadsworth (1790–1851). She was the third US Navy ship named *Wadsworth*. She was the second “short-hull” (Flight I) OHP frigate 445 ft (136 m) long.

### 2.3.1 History

Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 27 February 1976 as part of the FY75 program, *Wadsworth*, formally **PF-111**,<sup>\*[1]</sup> was laid down on 13 July 1977, launched on 29 July 1978, and commissioned on 28 February 1980. *Wadsworth* was sponsored by Mrs. Patricia P. Roberts, the great-great-great-granddaughter of Commodore Alexander S. Wadsworth.<sup>\*[2]</sup> Decommissioned on 28 June 2002, *Wadsworth* was handed over to Poland the same day and commissioned as **ORP General Tadeusz Kościuszko**, after Tadeusz Kościuszko an American Revolutionary War hero in the United States and an independence hero in Poland. She was formally stricken from the Navy list on 23 July 2002.

*Wadsworth* portrayed *Reuben James* in the 1990 film *The Hunt for Red October*.

The ship's motto was “For One's Country” and originates from the words of Captain Isaac Hull, Commanding Officer of USS *Constitution* before her August 1812 battle with HMS *Guerriere*. Hull said, “Men, now do your duty. Your officers cannot have entire command over you now. Each man must do all in his power for his country.”<sup>\*[3]</sup>

*Wadsworth* and her crew received Battle Effectiveness Awards for operations in 1993, 1998 and 2001.<sup>\*[4]</sup>

### 2.3.2 References

- This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).

- This article includes information collected from the *Naval Vessel Register*, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).

- [1] "USS Wadsworth (FFG 9)". Navysite.de. Retrieved April 10, 2015.
- [2] "Wadsworth III". *Dictionary of American Naval Fighting Ships*. Retrieved 2014-05-19.
- [3] "Coat of Arms" . USSWadsworth.org. Retrieved 2014-05-19.
- [4] "Navy Unit Awards" . Navy Unit Awards. Retrieved 2014-05-19.

### 2.3.3 External links

- USS Wadsworth FFG-9 Memorial Site
- navysite.de: *USS Wadsworth*
- MaritimeQuest USS Wadsworth FFG-9 pages
- NVR FFG-9

## 2.4 USS Duncan (FFG-10)

For other ships of the same name, see [USS Duncan](#).

The **USS *Duncan* (FFG-10)** was the fourth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, and was named for Vice Admiral Donald B. Duncan (1896–1975). Ordered from Todd Pacific, Seattle, Washington on 27 February 1976 as part of the FY75 program, *Duncan* was laid down on 29 April 1977, launched on 1 March 1978, and commissioned on 15 May 1980, CDR Ross D. Barker in command.

### 2.4.1 History

*Duncan*, former **PF-111**,<sup>\*[1]</sup> was sponsored by Mrs. Aniela Mateja Duncan, widow of the ship's namesake.<sup>\*[2]</sup>

In December 1982, *Duncan* developed a 40 feet (12 m) fissure in her superstructure during a storm.<sup>\*[3]</sup> It was a class design deficiency that occurred on other frigates.<sup>\*[4]</sup>

In January 1984, *Duncan* was transferred to the United States Navy Reserve Fleet and Selected Reserve (SELRES) members provided for a portion of the ship's manning.<sup>\*[5]</sup>

*Duncan* and her crew were awarded the **Battle Effectiveness Award** five times for 18 month time periods ranging from July 1981 to June 1983 and July 1986 to December 1990.<sup>\*[6]</sup>

*Duncan* participated in Port of Hueneme Harbor Days in October 1992.<sup>\*[7]</sup>

In March 1993, sailors aboard *Duncan* rescued four fisherman from Ecuador who were stranded on their disabled fishing boat in the Pacific Ocean. *Duncan* towed their boat to safety in Manta, Ecuador.<sup>\*[8]</sup> *Duncan* and her crew were nominated for the **Humanitarian Service Medal** in March 1993, but no unit award was given.<sup>\*[6]</sup>

### 1992 Sitka port visit

*Duncan* participated in **Sitka, Alaska**'s 125th anniversary **Alaska Day** celebration, 18 October 1992. The port visit became notorious following allegations of sexual misconduct with minors by crew members and the event's relative proximity to the Tailhook scandal and subsequent investigation.<sup>\*[9]</sup> After *Duncan* was decommissioned, the story reappeared in national media in 1996, following investigative reporting by the **Dayton Daily News' Russell Carollo**, due to complaints that the Navy didn't adequately punish the sailors involved.<sup>\*[10]</sup> A grand jury in Sitka indicted two *Duncan* sailors on sexual assault charges,<sup>\*[11]</sup> but the cases were dismissed in January 1997 due to prosecutorial delay and the Judge's determination that the two had already been tried by the Navy. A 22-year-old Ensign had faced court martial, but pleaded down to a letter of reprimand. Later, he also received an other than honorable discharge. The second sailor, a 23-year-old enlisted man, also faced court martial, but his charges were dropped by the court's presiding officer.<sup>\*[12]</sup>

### Decommissioning

*Duncan* was decommissioned on 17 December 1994 and stricken on 5 January 1998, *Duncan* was sold to Turkey on 5 April 1999 for use as a parts hulk. She was the first Perry frigate to be decommissioned, in commission for just 14.6 years. At the time, the Soviet Union had recently collapsed and *Duncan* was one of the oldest, unmodified, short hulled frigates in the fleet. She lacked some of the options others in her class had been modified with. For example, as a short hull ship, she did not have SH-60 Seahawk capability and a RAST to haul down the helicopter and transport it into the hangar. She also lacked a towed array sonar (TACTAS) and the MK-92 COherent Receiver Transmitter (CORT) modification.

### 2.4.2 References

This article includes information collected from the *Naval Vessel Register*, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).

- [1] "USS Duncan (FFG 10)". Navysite.de. Retrieved April 10, 2015.

- [2] "USS Duncan (FFG-10)". *geocities.ws*. Retrieved 2014-05-24.
- [3] Daniels, R.J (2004). *The End Of An Era: The Memoirs Of A Naval Constructor*. Penzance: Periscope Publishing Ltd. p. 219. ISBN 978-1-904381-18-1. OCLC 56400391.
- [4] *Transactions of the Royal Institution of Naval Architects, Volume 131*. London: Royal Institution of Naval Architects. 1989. p. 90. Retrieved 2014-05-24.
- [5] *USS Duncan (FFG-10) Crew's Book*. 1984. p. 70.
- [6] "Navy Unit Awards" . *Navy Unit Awards*. Retrieved 2014-05-24.
- [7] Smith, Ed (1992-10-03). "Frigate gets red-carpet welcome from Port Hueneme" . *Oxnard Press-Courier* (Oxnard, California).
- [8] Warner, Gary A. (1993-03-06). "Naval Officer from OC leads rescue" . *Orange County Register* (Santa Ana, California).
- [9] "Sailors under investigation for misconduct with minors" . *European Stars And Stripes*. 1992-11-16.
- [10] Carollo, Russell (1995-10-16). "Tailhook's shadow eclipsed sordid tale of Alaskan port call" . *European Stars And Stripes*.
- [11] "Two ex-sailors charged in alleged '92 sexual assault" . *European Stars And Stripes*. 1996-03-10.
- [12] "Charges Dismissed in Navy, Sitka case" . *Daily Sitka Sentinel* (Sitka, Alaska). 1997-01-03.

#### 2.4.3 See also

- Gölcük Naval Base - location of several of the ex-USN Oliver Hazard Perry class frigates in service with Turkey and one mast-less hulk, possibly ex-Duncan.

#### 2.4.4 External links

- Navsource.org - FFG-10
- MaritimeQuest USS Duncan FFG-10 pages

## 2.5 USS Clark (FFG-11)

For other ships of the same name, see **USS Clark**.

The second **USS Clark (FFG-11)**, fifth ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Admiral Joseph James "Jocko" Clark (1893–1971).

### 2.5.1 History

Ordered from Bath Iron Works on 27 February 1976 as part of the FY76 program, *Clark* was laid down on 17 July 1978, launched on 24 March 1979, and commissioned on 9 May 1980. The Ship sponsor was Mrs. Olga Clark, the widow of Admiral Clark.

In July 1982, *Clark* recovered three sailors that were washed overboard from the aircraft carrier *John F. Kennedy* in the Atlantic Ocean off the coast of Spain.\*[2] A fourth sailor was not recovered and was lost at sea.\*[3]

In December 1992, *Clark* was nearby when the crew of an *F-14* was forced to eject during training operations off the coast of Virginia. *Clark*'s helicopter rescued the radar intercept officer and a United States Coast Guard helicopter rescued the pilot.\*[4]

In April 1994, *Clark* changed homeports from *Newport, Rhode Island*, to *Norfolk, Virginia*.\*[5] The ship had previously been homeported in *Philadelphia, Pennsylvania* from the mid-1980s to 1992 and *Mayport, Florida* before that.

Decommissioned and stricken on 15 March 2000, she was handed over to Poland that same day to become the Polish Navy's ORP *General Kazimierz Pułaski*, after Kazimierz Pułaski, a Pole who was appointed the rank of Brigadier General in the Continental Army cavalry and fought in the American Revolutionary War.

### 2.5.2 Awards

*Clark* and her crew received the following unit awards, according to the US Navy unit awards website.\*[6]

- Humanitarian Service Medal for the evacuation of Lebanon, 23 to 25 June 1982
- Armed Forces Expeditionary Medal for Lebanon from 11 December 1983 to 21 January 1984
- US Coast Guard Unit Commendation, 31 October 1984 to 31 December 1984
- Meritorious Unit Commendation, 1 February 1984 to 21 April 1984
- US Coast Guard Special Operations Service Ribbon, 3 awards, for April to June 1989, July to September 1989 and 19 January 1990 to 24 February 1990.
- Navy E Ribbon, 2 awards, for the years of 1992 and 1995
- Joint Meritorious Unit Award for the year of 1997.

*Clark* was also nominated for the United States Public Health Service Outstanding Unit Citation for operations from 24 June 1994 to 12 July 1994, but did not receive

the award. The ship was reported near Haiti in mid July 1994\*[7] around the time many refugees were fleeing Haiti in small boats.\*[8]

### 2.5.3 References

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

- [1] "USS Clark (FFG 11)". navysite.de. Retrieved April 10, 2015.
- [2] Associated Press (1982-07-07). "Sailor Missing from Carrier". *Daily News Record* (Harrisonburg, Virginia).
- [3] "Man Overboard: Sailor Recalls Ordeal". *The Winchester Star* (Winchester, Virginia). 1982-07-15.
- [4] "Navy Jet Crashes Into Ocean". *Daily Press* (Hampton Roads, Virginia). 1992-12-16.
- [5] Associated Press title= Underway for Good (1994-04-18). *Pacific Stars And Stripes*. Missing or empty |title= (help)
- [6] "Unit Awards". US Navy.
- [7] Associated Press (1994-07-16). "Haitian Crisis Deepens". *European Stars And Stripes*.
- [8] Associated Press (June 29, 1994). "Haitians to go to Guantanamo". *Syracuse Herald-Journal* (Syracuse, New York).

### 2.5.4 External links

- Navsource.org - USS Clark (FFG-11)
- MaritimeQuest USS Clark FFG-11 pages

## 2.6 USS George Philip (FFG-12)

**USS George Philip (FFG-12)**, sixth ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Commander George Philip Jr. (1912 – 1945), posthumous winner of the Navy Cross for actions as commanding officer of the destroyer *USS Twiggs*.\*[2] Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 27 February 1976 as part of the FY76 program, *George Philip* was laid down on 14 December 1977, launched on 16 December 1978, and commissioned on 10 October 1980. Decommissioned on 15 March 2003, as of June 2003 *George Philip* was in reserve at Naval Inactive Ships Maintenance Facility Bremerton, Washington.

*George Philip* was expected to join the Portuguese Navy in 2006, together with her sister ship *Sides*, but the Portuguese Navy dropped the offer and chose two Dutch *Karel Doorman*-class frigates instead. *George Philip* was

expected to join the Turkish Navy in the summer of 2008, together with her sister ship *Sides*, but the Turkish Navy dropped the offer. As of May 2012, both frigates were awaiting their fates at anchor in the Sinclair Inlet off the Puget Sound Naval Shipyard and Intermediate Maintenance Facility.\*[1]

### 2.6.1 History

#### 1980s

*George Philip* was sponsored by Snow Philip-Simpson, daughter of the ship's namesake, George Philip Jr. at the ship launching on 16 December 1978. *George Philip* was commissioned 15 November 1980 at Todd Shipyard in San Pedro, California, Commander James L. Turnbull in command.

From November 1980 to June 1981 *George Philip* conducted sea trials and testing. In June 1981 the ship received the Battle "E" award for excellence.

From July 1982 to February 1983 *George Philip* deployed for the first time in support of *USS Enterprise* battle group. On 26 November 1982 Cmdr. Donald F. Berkebile assumed command. *George Philip* and her crew were awarded a Battle Effectiveness Award for operations during the 18-month period from 1 January 1982 to 30 June 1983.\*[3]

From September 1984 to March 1985 the ship was deployed in support of U. S. efforts to keep sea lanes open in the Persian Gulf during the height of the Iran-Iraq war. On 15 March 1985 Cmdr. Frank Harold Tryon, Jr. assumed command. In June 1985 the frigate transferred to the Naval Reserve Force (NRF). As a member of the NRF, the focus turns to the training and readiness of Selected Reservists. The ship goes from full manning to 60% manning, with the remainder made up of Reservists. From June 1985 to June 1987 engineering and weapons readiness examinations and inspections were performed along with training for helicopter pilots. On 9 May 1987 Cmdr. Thomas C. William, Jr. assumed command.

*George Philip* underwent an overhaul at Southwest Marine in San Diego, California from December 1987 to June 1989. While in overhaul the ship received major upgrades in anti-submarine warfare (ASW) capabilities among which, the ship was fitted with a Tactical Towed Array Sonar (TACTASS).

On 10 June 1989, Cmdr. Dennis Leo Ryan III assumed command. From June 1989 to May 1992 *George Philip* participated in extensive ASW operations and was used as a test platform for the new ASW equipment.\*[4]

#### 1990s

On 15 June 1991, Cmdr. Alfred W. Mitchell assumed command. From May to August 1992 *George Philip* was

deployed in support of efforts to counter drug traffic from South America to the United States. In August 1992 the ship began a series of independent operations and port visits that included: San Francisco; Seattle; Vancouver, British Columbia; and Mazatlán, Mexico. On 20 February 1993, Cmdr. Harold Joseph Flammang, Jr. assumed command.

These operations lasted until July 1994 when *George Philip* deployed in support of efforts to counter drug traffic from South America to the United States. In October 1994 the frigate was escort to the towing of the retired submarine *USS Richard B. Russell* to Bremerton Naval Station. On 16 December 1994, Cmdr. Robert Alan Butt assumed command.

*George Philip* and her crew were awarded a Battle Effectiveness Award for operations in 1994, 1995 and 1996.\*[3]

On 24 October 1996, Cmdr. Scott Alan Berg assumed command. In November 1997 the ship participated in the Maritime Combined Operational Training (MARCOT) Exercise in the Northern Pacific. From January to April 1998 *George Philip* took part in counter-narcotics operations (CNOPS) in the South Pacific. On 24 April 1998, Commander Leland Hart Sebring assumed command.

From March to October 1999 the ship was assigned to the Co-operation Afloat Readiness and Training (CARAT) Deployment.\*[4] On 2 November 1999, Commander David W. Glazier assumed command.

## 2000s

*George Philip* underwent the Dry-Docking Selected Restricted Availability (DSRA 00) at Continental Marine in San Diego from January to March 2000. In April *George Philip* transited to Alaska. The frigate conducted port visits to Esquimalt, British Columbia and Juneau, Alaska. On 2–8 October 2000 the ship made a port visit to Ensenada, Mexico.\*[4]

On 10 June 2001, Cmdr. Christopher L. Wall assumed command. *George Philip* was decommissioned on 15 March 2003, as of June 2003 the ship was in reserve at Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Bremerton, Washington.

## 2.6.2 References

This article includes information collected from the *Naval Vessel Register*, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).

- [1] “FFG-12” . Navysite.de. Navysite.de. Retrieved 2015-04-10.
- [2] “Valor awards for George Philip Jr” . Military Times. Retrieved 2014-05-30.

[3] “Navy Unit Awards” . *Navy Unit Awards*. Retrieved 2014-05-18.

[4] “Ship's History” . *USS George Philip (FFG-12) – Public Domain, US Navy*. Archived from the original on 2003-02-21. Retrieved 2014-06-03.

## 2.6.3 External links

- MaritimeQuest USS George Philip FFG-12 pages

## 2.7 USS Samuel Eliot Morison (FFG-13)

**USS Samuel Eliot Morison (FFG-13)**, was the seventh *Oliver Hazard Perry*-class frigate in service with the United States Navy. She was named for Rear Admiral Samuel Eliot Morison (1887–1976), one of America's most distinguished naval historians, who wrote more than 40 books on naval history.

*Samuel Eliot Morison* was the first ship of that name in the U.S. Navy.

### 2.7.1 TCG Gökova (F 496)

On 11 April 2002, *Samuel Eliot Morison* was decommissioned and transferred to Turkey, where she was renamed as TCG *Gökova* (F 496) and joined the other *Oliver Hazard Perry*-class vessels acquired by the Turkish Navy as G-class frigates. As of 2015, she is still in active service.

- USS Samuel Eliot Morison (FFG-13)

### 2.7.2 References

- [1] “USS Samuel Eliot Morison (FFG 13)”. Navsource.org. Retrieved April 10, 2015.
- [2] “USS Samuel Eliot Morison (FFG 13)”. Navysite.de. Retrieved April 10, 2015.

*This article includes information collected from the *Naval Vessel Register*, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.7.3 External links

- MaritimeQuest USS Samuel Eliot Morison FFG-13 pages

## 2.8 USS Sides (FFG-14)

**USS Sides (FFG-14)** is an *Oliver Hazard Perry* class guided-missile frigate of the US Navy.

## 2.8.1 History

The eighth ship in the class, it was named for Admiral John H. Sides (died 1978). Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California, on 27 February 1976 as part of the FY76 program, *Sides* was laid down on 7 August 1978, launched on 19 May 1979, and commissioned on 30 May 1981. *Sides* ship sponsor was Mrs. Joanne Sides Watson, daughter of Admiral Sides.

*Sides* escorted tankers through the Straits of Hormuz during the **Tanker War** and participated in **Operation Praying Mantis**, the retaliation for Iranian mining operations. The *Sides* was also part of the Surface Action Group under **USS Vincennes** when **Iran Air 655** was shot down. *Sides* and her crew received a **Meritorious Unit Commendation** for the time period 13 April 1988 to 25 July 1988.\* [3]

*Sides* and her crew received **Navy E Ribbons** for the 18-month period, July 1983 to December 1984, and for the years 1995, 1999 and 2000.\* [3]

*Sides* was decommissioned on 28 February 2003 and as of 2014 was laid up in reserve at Naval Inactive Ships Maintenance Facility Bremerton, Washington.

*Sides* was expected to join the **Portuguese Navy** in 2006, together with her sister ship **George Philip**, but the Portuguese Navy dropped the offer and chose two Dutch **Karel Doorman Frigates** instead.

*Sides* was expected to join the **Turkish Navy** in the summer of 2008, together with her sister ship **George Philip**, but the Turkish Navy dropped the offer.

## 2.8.2 Further reading

- Wise, Harold Lee (2007). *Inside the Danger Zone: The U.S. Military in the Persian Gulf 1987–88*. Annapolis: Naval Institute Press. ISBN 1-59114-970-3.

## 2.8.3 References

This article includes information collected from the **Naval Vessel Register**, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).

- [1] "USS Sides (FFG 14)". Navesource.org. Retrieved April 10, 2015.
- [2] "USS Sides (FFG 14)". Navysite.de. Retrieved April 10, 2015.
- [3] "Unit Awards". US Navy.

## 2.8.4 External links

- MaritimeQuest USS Sides FFG-14 pages

## 2.9 USS Estocin (FFG-15)

**USS Estocin (FFG-15)**, ninth ship of the **Oliver Hazard Perry** class of guided-missile frigates, was named for Captain Michael John Estocin (1931–1967). Ordered from Bath Iron Works on 27 February 1976 as part of the FY76 program, *Estocin* was laid down on 2 April 1979, launched on 3 November 1979, and commissioned on 10 January 1981.

*Estocin* (FFG-15) was the first ship of that name in the US Navy. The ship's motto, listed on her crest, was "Courage, Honor, Tenacity".\* [2]

## 2.9.1 History

*Estocin* was sponsored by Michael John Estocin's widow, Mrs Quay Marie (Hampton) Estocin. Their three daughters served as maids of honor at the ceremonial launching and christening.\* [3]

## 1980s

After her commissioning, *Estocin* was assigned to Destroyer Squadron Eight, homeported in Mayport, FL. While there, she made deployments to the Mediterranean, the Indian Ocean, and participated in Special Operations off the Central American coast.\* [4]

*Estocin* and her crew were awarded the **Navy Expeditionary Medal** for operations near Lebanon between 10 October and 10 November 1982.\* [5] See also **Multinational Force in Lebanon**.



Estocin moored near EMPRESS I EMP test facility, Point Patience, Maryland, October 1985.

15 October 1985 *Estocin* ran aground near Key West, Florida.\* [6]

Throughout 1986, *Estocin* served as the Navy's testbed for the Mk-92 Fire Control System improvement project (CORT). The Mk-92 "CORT" program was a CNO Priority-1 Project, one of the only four in the entire Navy

at that time. These tests had *Estocin* tracking and engaging a variety of surface and air targets. Fifteen SM-1 medium range missiles and nearly 1000 rounds of 76mm ammunition were fired in the course of the test cycle. By the end of 1986, *Estocin* had logged nearly 15,000 underway miles in support of this project.\*[4] *Estocin* and her crew were awarded a Secretary of the Navy Letter of Commendation for operations between January and November, 1986.\*[5]

On 1 October 1986, *Estocin* officially became part of the Naval Reserve Force (NRF) reported to Naval Surface Warfare Group Four, homeported in Philadelphia, PA. Upon joining the NRF, *Estocin* operated primarily in the western Atlantic in support of Naval Reserve Training (NRT) and active fleet commitments. She logged frequent underway weekends devoted entirely to Selected Reserve crew training, as well as periodic underway periods of 2-week duration to enable reservists to complete their active duty training requirements. These operations took *Estocin* as far north as Nova Scotia and south to the Caribbean.\*[4]

*Estocin* and her crew were awarded a United States Coast Guard Special Operations Service Ribbon for operations July to September, 1989.\*[5]

## 1990s

*Estocin* was chosen to conduct a Great Lakes Cruise in 1991 in support of U.S. Navy recruiting efforts and to promote public awareness in America's heartland, through port calls to U.S. and Canadian cities on the Great Lakes. In the fall of 1991 and the spring of 1992, *Estocin* participated in Canadian Fleet Operations conducted with U.S. Navy and Canadian Maritime Command units in the area south of Nova Scotia.\*[4]

*Estocin* and her crew were awarded a Battle Effectiveness Award for operations in 1992.\*[5]

On 17 August 1992, *Estocin* changed homeport to Newport, RI. *Estocin* completed Maritime Interdiction Operations in the Caribbean and in December 1993 operated off the coast of Haiti during Operation Support Democracy. In January 1994, *Estocin* again changed her homeport moving to Naval Base, Norfolk, VA. *Estocin* was again selected for a Great Lakes Cruise in the summer of 1994. Upon completion of this cruise, she underwent a four-month drydock period to inspect and overhaul numerous shipboard systems. After completion of this drydocking, *Estocin* was sent in the fall of 1995 to the Caribbean in support of Counter Drug Operations. During this cruise, *Estocin* transited the Panama Canal to conduct Counter Drug Operations in the eastern Pacific as well.\*[4]

In 1996, after completing a work-up cycle, which included re-certification of her propulsion plant and cruise missile tactical qualification, *Estocin* deployed with De-



*Estocin* entering Hampton Roads, returning following Hurricane Felix, 1995.

stroyer Squadron Eighteen in support of Operation Northern Light-Bright Horizon 96. During this fast paced month and a half commitment, *Estocin* participated in a variety of maneuvering and training exercises with over 53 ships and submarines from 13 European nations. Upon her return to Norfolk, *Estocin* entered an availability period to prepare ship's systems for her next commitment, Joint Task Force Exercise 97-1 (JTFEX 97-1). During this exercise *Estocin* was the flagship for the Opposing Forces (OPFOR), whose mission was to train the deploying carrier battle group. Although composed of U.S. ships, the OPFOR simulated a variety of patrol boats found throughout the world. Successfully training the battle group, *Estocin* prepared for her next deployment.\*[4]

Assigned to Cruiser Destroyer Group Eight, *Estocin* deployed for Baltic Operations 97 (BALTOPS 97) in May 1997. The deployment entailed at-sea operations with ships from NATO countries as well as non-NATO countries such as Russia, Poland and Lithuania. BALTOPS 97 also included goodwill visits to former Eastern-Bloc nations. During this deployment, *Estocin* had the unique opportunity to become the first U.S. warship to visit two Russian ports in the same deployment, with stops in Baltiysk and Severomorsk, Russia. In addition, *Estocin* had the distinct privilege of hosting the Admirals of the Russian Baltic and Northern Fleets during her port calls.\*[4]

January 1999 found *Estocin* deploying for the Caribbean. Once again in support of Counter Drug Operations, *Estocin* set the standard in curbing the flow of drugs into the United States. After four and a half months in the Caribbean, including a cocaine seizure of over 400 kg (880 lb), *Estocin* returned home on 15 May.\*[4]

*Estocin* was underway once again at the end of June 1999 to participate in INDEX 99-2 with the USS *John F. Kennedy* Battle Group. During this exercise, *Estocin* simulated Opposing Forces during Harpoon, Anti Air Warfare, and Anti Submarine Warfare exercises. *Estocin*

proved her battle readiness in all areas as she conducted multiple PACFIRES with her 76mm gun, launched two Mk 46 Torpedoes and fired three successful SM-1 engagements. After achieving her best battle readiness condition in over four years, *Estocin* returned to Norfolk in July to conduct a nine-week Restricted Availability (RAV).<sup>\*[4]</sup>

After this maintenance period and successful training cycle workups, *Estocin* sailed late November 1999 to support preparing the USS *Dwight D. Eisenhower* Battle Group for deployment as an Opposition Force in JTFEX 00-1. She also participated in INDEX 99-3, which allowed training in all warfare areas for the crew. At the completion of the JTFEX, *Estocin* was chosen by Commander, Second Fleet to perform a bilateral exercise with two French Navy ships, the French cruiser *Jeanne d'Arc* and frigate *Georges Leygues*. This exercise provided valuable training for the midshipmen embarked on *Jeanne d'Arc* and helped to further strengthen the strong Naval ties with this NATO ally.<sup>\*[4]</sup>

## 2000s and decommissioning

As of 2000, *Estocin* was in homeport, Norfolk VA, preparing for upcoming exercises including: a group sail under the command of Commander, Destroyer Squadron Fourteen; a UNITAS exercise with ships from the U.S., Venezuelan and Colombian Navies; and participation with Brazilian and other nation naval units in honor of the 500th anniversary of the founding of Brazil in April 2000.<sup>\*[4]</sup>

*Estocin* and her crew were awarded a Battle Effectiveness Award for operations in 2000.<sup>\*[7]</sup>

On 14 May 2001, *Estocin* returned to homeport in Norfolk, Virginia after a five-month deployment to the Caribbean.<sup>\*[7]</sup>

*Estocin* and USS *Samuel Eliot Morison* swapped crews in late February 2002. Both frigates were scheduled to decommission in 2002, but following 11 September 2001, Navy leadership decided it might be advantageous to retain one of the two short hulled frigates. *Estocin* had already reduced crew size nearly 40% preparing to decommission, but she was the more recently modernized of the two frigates. Former *Samuel Eliot Morison* sailors served on *Estocin* and their ship was decommissioned 11 April 2002.<sup>\*[8]</sup> *Estocin* was decommissioned in Mayport, Florida and stricken a year later on 3 April 2003.<sup>\*[9]</sup> She was the last short-hulled FFG operational with the US Navy.<sup>\*[10]</sup>

## 2.9.2 TCG *Göksu* (F 497)

On 3 April 2003, *Estocin* was decommissioned, stricken from the Navy list and transferred to Turkey as that nation's TCG *Göksu* (F 497). As of 2015, she is still in



TCG *Göksu* (F 497) in April 2015.

active service.

### 2.9.3 See also

- RADM David M. Thomas Jr., former engineering officer, USS *Estocin* (FFG-15)

### 2.9.4 References

This article includes information collected from the *Naval Vessel Register*, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).

- [1] "USS Estocin (FFG 15)". Navysite.de. Retrieved April 10, 2015.
- [2] "Ship's Crest". Navsource.org. Retrieved 2014-05-18.
- [3] "Warship to bear graduate's name". New Castle News (New Castle, Pennsylvania). 1979-11-03.
- [4] "History of USS Estocin (FFG-15)". 2001-02-08. Archived from the original on 2001-02-08. Retrieved 2014-05-18. (Public Domain USN Source.)
- [5] "Navy Unit Awards". Navy Unit Awards. Retrieved 2014-05-18.
- [6] Arkin, William M.; Handler, Joshua (1989). *Naval accidents, 1945-1988*. Washington D.C.: Greenpeace. p. 67. Retrieved 2014-05-18.
- [7] "News for USS Estocin (FFG-15)". 2001-02-09. Archived from the original on 2001-02-09. Retrieved 2014-05-19. (Public Domain USN Source.)
- [8] Atlantic Fleet Surface Force Public Affairs (2002-03-01). "Estocin and S.E. Morison Crews Swap Ships". Navy News Service (Norfolk, Virginia: US Navy). Retrieved 2014-05-19.
- [9] Naval Station Mayport Public Affairs (2003-04-06). "USS Estocin Decommissioned". Navy News Service (Mayport, Florida: US Navy). Retrieved 2014-05-19.
- [10] "Oliver Hazard Perry-class frigate". Destroyer History Foundation. Retrieved 2014-05-19.

## 2.9.5 External links

- MaritimeQuest USS Estocin FFG-15 pages
- Photo gallery of USS *Estocin* (FFG-15) at NavSource Naval History
- Navysite.de - USS Estocin FFG-15 page

## 2.10 USS Clifton Sprague (FFG-16)

**USS Clifton Sprague (FFG-16)**, is an *Oliver Hazard Perry*-class guided missile frigate of the United States Navy, the tenth ship of that class. She was named for Vice Admiral Clifton A. F. Sprague (1896–1955), hero of the Samar action of the Battle of Leyte Gulf, where he received the Navy Cross. *Clifton Sprague* (FFG-16) was the first ship of that name in the US Navy.

### 2.10.1 History

Ordered from Bath Iron Works on 27 February 1976 as part of the FY76 program, *Clifton Sprague* was laid down 30 July 1979, launched 16 February 1980, and commissioned 21 March 1981.

*Clifton Sprague* was part of the forces during Operation Urgent Fury, the US led 1983 Invasion of Grenada.\*[2]

In July 1993, the guided-missile cruiser USS *Gettysburg* and *Clifton Sprague* participated in a passing exercise (PASSEX) with three Russian ships, cruiser *Marshal Ustinov*, destroyer *Admiral Kharlamov* and the replenishment ship *Dnester*. This was noteworthy because the two navies had an adversarial relationship for decades prior to the Dissolution of the Soviet Union.\*[3]

*Clifton Sprague* was part of the flotilla for Operation Uphold Democracy, the September 1995 US intervention in Haiti.\*[4]

She was decommissioned on 2 June 1995 at Naval Station Mayport, Florida, and was stricken from the US Navy register on 4 September 1997 after being transferred to Turkey.

### 2.10.2 TCG Gaziantep (F 490)

She was transferred to Turkey on 27 August 1997 as that nation's TCG *Gaziantep* (F 490), and then immediately modified into a G-class frigate by the Turkish Naval Yard. As of 2011, she was still in active service.

### 2.10.3 Awards

*Clifton Sprague* and her crew received the following unit awards, according to the US Navy unit awards web-

site:\*[5]

- Navy E Ribbon, 1 October 1980 to 30 September 1981
- Navy E Ribbon, 1 October 1981 to 30 September 1982
- Navy Expeditionary Medal, 18 April 1983 to 22 April 1983, 1983 United States embassy bombing, Lebanon
- Meritorious Unit Commendation, 23 October 1983 to 2 November 1983, Invasion of Grenada / Operation Urgent Fury
- Armed Forces Expeditionary Medal, 23 October 1983 to 18 November 1983, Invasion of Grenada / Operation Urgent Fury
- Navy E Ribbon 1 October 1983 to 31 March 1985
- Navy E Ribbon 1 April 1985 to 30 September 1986
- Coast Guard Special Operations Service Ribbon for 1 April 1989
- Coast Guard Special Operations Service Ribbon, 1 July 1989 to 30 September 1989
- Secretary of the Navy Letter of Commendation, 1 December 1989 to 1 April 1990
- Joint Meritorious Unit Award, 28 January 1991 to 25 February 1991, this was in the Desert Storm time period, but FFG-16 was not listed as participating in the Gulf War.\*[6]
- Armed Forces Expeditionary Medal, 16 September 1994 to 24 September 1994, Operation Uphold Democracy Haiti
- Meritorious Unit Commendation, 11 September 1994 to 31 March 1995, Operation Uphold Democracy Haiti

*Clifton Sprague* was also nominated for the United States Public Health Service Outstanding Unit Citation for operations from 24 June 1994 to 12 July 1994, but did not receive the award. This was around the time that many refugees were fleeing Haiti in small boats.\*[7]

### 2.10.4 References

- [1] "USS Clifton Sprague (FFG 16)". Navysite.de. Retrieved 10 April 2015.
- [2] "Facts: 30th Anniversary of the U-S-Caribbean Intervention in Grenada". US Southern Command.
- [3] Associated Press (7 July 1993). "USS *Gettysburg* trains with Russian Ships". *Gettysburg Times*.

- [4] Associated Press (15 September 1994). “American Flotilla” . *Colorado Springs Gazette Telegraph*.
- [5] “Unit Awards” . US Navy.
- [6] “Desert Storm Apdx B” . *US Naval History and Heritage Command*.
- [7] Associated Press (29 June 1994). “Haitians to go to Guantanamo” . *Syracuse Herald-Journal* (Syracuse, New York).

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*



Gediz

### 2.10.5 External links

- MaritimeQuest USS Clifton Sprague FFG-16 pages

## 2.11 USS John A. Moore (FFG-19)

**USS John A. Moore (FFG-19)**, eleventh ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Commander John Anderson Moore (1910–1944). Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 28 February 1977 as part of the FY77 program, *John A. Moore* was laid down on 19 September 1978, launched on 20 October 1979, and commissioned on 14 November 1981.

*John A. Moore* was the first ship of that name in the US Navy. The namesake was commanding officer of the submarine *USS Grayback* (SS-208) in 1943 and 1944. Cdr. Moore received three awards of the Navy Cross during his command, the last posthumously after *Grayback* was sunk in February 1944.

### 2.11.1 TCG Gediz (F 495)

Decommissioned and stricken on 1 September 2000, she was transferred to Turkey as that nation's TCG *Gediz* (F 495). As of 2015,\*[2] she is still active in the service of the Turkish Navy.

### 2.11.2 In other media

On the television show *JAG* the ship was used multiple times. It was used in season 3 episode “Tiger, Tiger”, where *USS John A. Moore* played the part of a fictional frigate *USS Stockdale* (FFG-62). In the season 5, episode 7 “Rogue” the ship played the fictional frigate *USS Ellylon* (FFG-19).

### 2.11.3 References

- [1] “USS John A. Moore (FFG 19)”. Navysite.de. Retrieved April 10, 2015.
- [2] “TCG Gediz sets sail for Far East” . *turkishnavy.net*. April 3, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.11.4 External links

- MaritimeQuest USS John A. Moore FFG-19 pages

## 2.12 USS Antrim (FFG-20)

For other ships of the same name, see *USS Antrim*.

**USS Antrim (FFG-20)** was the twelfth ship of the *Oliver Hazard Perry* class of guided-missile frigates. She was named for Rear Admiral Richard Nott Antrim (1907–1969). Ordered from Todd Pacific, Seattle, Washington on 28 February 1977 as part of the FY77 program, *Antrim* was laid down on 21 June 1978, launched on 27 March 1979, and commissioned on 26 September 1981.\*[2]

### 2.12.1 History

On 10 February 1983, *USS Antrim* was conducting a live fire exercise off the east coast of the United States using the Phalanx CIWS against a target drone. Although the drone was successfully engaged at close range, the target debris bounced off the sea surface and struck the ship, causing significant damage and fire from the drone's residual fuel which killed a civilian instructor;\*[1]\*[3]

Decommissioned on 8 May 1996, she was transferred to Turkey on 27 August 1997. She was stricken from the U.S. Naval Vessel Register on 4 September 1997.

### 2.12.2 TCG *Giresun* (F 491)

The ship serves in the Turkish Navy as **TCG *Giresun* (F 491)**.

On 16 March 2009, TCG *Giresun*, along with HDMs *Absalon* successfully prevented a pirate attack on the Vietnamese cargo ship MV *Diamond Falcon* from succeeding in capturing the target ship.\*[4]\*[5] On 6 March 2011, she aided the destroyer USS *Bulkeley* in the capture of 4 pirates who had attacked the tanker MV *Guanabara*. The pirates were later flown to Tokyo for trial.

### 2.12.3 References

- [1] "USS Antrim (FFG 20)". *Unofficial UN Navy site*. Retrieved 7 October 2014.
- [2] "Antrim (FFG-20) ii". Naval History and Heritage Command. Retrieved April 9, 2015.
- [3] "Antrim FFG-20". Navyhistory.com. Retrieved 7 October 2014.
- [4] "Đan Mạch, Thổ Nhĩ Kỳ cùng giải cứu tàu hàng Việt Nam". Viet bao.com (in Vietnamese). 16 March 2009. Retrieved 24 March 2009.
- [5] "Vietnamese Cargo Ship Rescued From Pirates – Turkish Army". The Morning Star. 16 March 2009. Retrieved 24 March 2009.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.12.4 External links

- MaritimeQuest USS Antrim FFG-20

## 2.13 USS Flatley (FFG-21)

**USS *Flatley* (FFG-21)** was the thirteenth ship of the *Oliver Hazard Perry* class of guided-missile frigates. She was the first ship of the U.S. Navy to be named for Vice Admiral James H. Flatley (1906–1958), a leading Naval Aviation tactician from World War II who flew the F4F Wildcat in the Battle of Coral Sea and subsequently commanded the VF-10 Grim Reapers taking them into combat for the first time.

Ordered from Bath Iron Works on 28 February 1977 as part of the FY77 program, *Flatley*'s keel was laid down on 13 November 1979. She was launched on 15 May 1980,

and commissioned on 20 June 1981. Decommissioned on 11 May 1996, she was sold to Turkey on 27 August 1998.

### 2.13.1 TCG *Gemlik* (F 492)

The ship immediately underwent conversion into a Turkish G-class frigate. She serves in the Turkish Navy as TCG *Gemlik* (F 492).

### 2.13.2 References

- [1] "USS Flatley (FFG 21)". Navsource.org. Retrieved April 11, 2015.
- [2] "USS Flatley (FFG 21)". Navysite.de. Retrieved April 11, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.13.3 External links

- MaritimeQuest USS Flatley FFG-21 pages

## 2.14 USS Fahrion (FFG-22)

**USS *Fahrion* (FFG-22)**, fourteenth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Admiral Frank George Fahrion (1894–1970).

Ordered from Todd Pacific, Seattle, WA on 28 February 1977 as part of the FY77 program, *Fahrion* was laid down on 1 December 1978, launched on 24 August 1979, and commissioned on 16 January 1982. Transferred to Egypt on 15 March 1998 as **Sharm El-Sheik (F901)**, she was formally decommissioned and stricken on 31 March 1998. As of 2012, *Sharm El-Sheik* remained in active service with the Egyptian Navy.\*[1]

*Fahrion* (FFG-22) was the first ship of that name in the US Navy.

### 2.14.1 Operations and Missions

- Operation Earnest Will -MEF 2–86
- Operation Earnest Will -MEF 2–88 (May 1988 – Sept 1988)
- Baltops 89 (June 1989 – Sept 1989)
- Great Lakes Cruise (June 1990 – September 1990)
- Operation Abel Vigil (June 1994 – August 1994)\*[4]

- UNITAS 36–95 (27 June 1995<sup>\*</sup>[5]-December 1995)
- Great Lakes Cruise (June 1997 – September 1997)

### 2.14.2 See also

- List of ship launches in 1979
- List of ship commissionings in 1982
- List of ship commissionings in 1998
- List of ship decommissionings in 1998

### 2.14.3 References

- [1] Wertheim, Eric, ed. (2007). "Egypt" . *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems* (15th ed.). Annapolis, Maryland: Naval Institute Press. p. 171. ISBN 978-1-59114-955-2. OCLC 140283156.
- [2] "USS Fahrion (FFG 22)". Navsource.org. Retrieved April 11, 2015.
- [3] "USS Fahrion (FFG 22)". Navysite.de. Retrieved April 11, 2015.
- [4] <http://www.globalsecurity.org/military/agency/navy/ffg-22.htm>
- [5] <http://www.armfor.uscourts.gov/opinions/1999Term/98-0095.htm>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.14.4 External links

- MaritimeQuest USS Fahrion FFG-22 pages
- GlobalSecurity.org FFG-22

## 2.15 USS Lewis B. Puller (FFG-23)

For other ships of the same name, see [USS Lewis B. Puller](#).

**USS Lewis B. Puller (FFG-23)** was the fifteenth ship of the *Oliver Hazard Perry* class of guided-missile frigates in the US Navy. She was the first US Navy ship to be named for Marine Lieutenant General Lewis B. "Chesty" Puller (1898–1971). Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 28 February 1977 as part of the FY77 program, *Lewis B. Puller* was laid down on 23 May 1979, launched on 15 March

1980, and commissioned on 17 April 1982. Decommissioned and stricken on 18 September 1998, she was transferred to Egypt the same day as **Toushka (F906)**. As of 2013, she remained in active service with the Egyptian Navy.<sup>\*[1]</sup>

### 2.15.1 See also

- [USNS Lewis B. Puller \(T-MLP-3/T-AFSB-1\)](#)

### 2.15.2 References

- [1] Wertheim, Eric, ed. (2007). "Egypt" . *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems* (15th ed.). Annapolis, Maryland: Naval Institute Press. p. 171. ISBN 978-1-59114-955-2. OCLC 140283156.
- [2] "USS Lewis B. Puller (FFG 23)". Navsource.org. Retrieved April 11, 2015.
- [3] "USS Lewis B. Puller (FFG 23)". Navysite.de. Retrieved April 11, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.15.3 External links

- MaritimeQuest USS Lewis B. Puller FFG-23 pages
- GlobalSecurity.org FFG-23

## 2.16 USS Jack Williams (FFG-24)

**USS Jack Williams (FFG-24)**, sixteenth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Pharmacist's Mate Third Class Jack Williams, who was posthumously awarded the Medal of Honor for his heroism in the Battle of Iwo Jima.

Ordered from Bath Iron Works, Bath, Maine, on 28 February 1977 as part of the FY77 program, *Jack Williams* was laid down on 25 February 1980; launched on 30 August 1980, sponsored by Mrs. Fern Williams Carr, sister of PhM3c Williams; and commissioned on 19 September 1981, Commander Hugh Edward Carroll II in command.

Decommissioned and stricken on 13 September 1996, she was transferred to Bahrain the same day and recommissioned as **RBNS Sabha (FFG-90)**.

*Jack Williams* (FFG-24) was the first ship of that name in the US Navy.

## 2.16.1 References

- [1] "USS Jack Williams (FFG 24)". Navsource.org. Retrieved April 11, 2015.
- [2] "USS Jack Williams (FFG 24)". Navysite.de. Retrieved April 11, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.16.2 External links

- Photo gallery of USS *Jack Williams* at NavSource Naval History
- navysite.de: *USS Jack Williams*
- MaritimeQuest USS *Jack Williams* FFG-24 pages

## 2.17 USS Copeland (FFG-25)

**USS Copeland (FFG-25)** was the seventeenth ship of the *Oliver Hazard Perry*-class of guided-missile frigates in the United States Navy. She was named for Rear Admiral Robert W. Copeland (1910–1973).

Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 28 February 1977 as part of the FY77 program, *Copeland* was laid down on 24 October 1979, launched on 26 July 1980, and commissioned on 7 August 1982. Decommissioned and stricken on 18 September 1996, she was transferred to Egypt the same day as **Mubarak (F911)**. After the 2011 revolution the ship was renamed to remove the former ruler's name. The ship is named **Alexandria (F911)** now. As of 2012, she remained in active service with the Egyptian Navy.\*[1]

*Copeland* was the first ship of that name in the US Navy.

## 2.17.1 References

- [1] Wertheim, Eric, ed. (2007). "Egypt". *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems* (15th ed.). Annapolis, Maryland: Naval Institute Press. p. 171. ISBN 978-1-59114-955-2. OCLC 140283156.
- [2] "USS Copeland (FFG 25)". Navsource.org. Retrieved April 11, 2015.
- [3] "USS Copeland (FFG 25)". Navysite.de. Retrieved April 11, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.17.2 External links

- MaritimeQuest USS *Copeland* FFG-25 pages
- Photo gallery of *USS Copeland* at NavSource Naval History

## 2.18 USS Gallery (FFG-26)

**USS Gallery (FFG-26)**, eighteenth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for three brothers: Rear Admiral Daniel V. Gallery (1901–1977), Rear Admiral William O. Gallery (1904–1981), and Rear Admiral Philip D. Gallery (1907–1973). Ordered from Bath Iron Works, Bath, Maine, on 28 February 1977 as part of the FY77 program, *Gallery* was laid down on 17 May 1980, launched on 20 December 1980, co-sponsored by Mrs. Philip D. Gallery and Mrs. Daniel V. Gallery, and commissioned on 5 December 1981, commanded by Commander Norman Stuart Scott. Decommissioned and stricken on 14 June 1996, she was transferred to Egypt on 25 September 1996 as **Taba (F916)**. As of 2007, she remained in active service with the Egyptian Navy.\*[1]

*Gallery* (FFG-26) was the first ship of that name in the US Navy.

## 2.18.1 Coat of Arms

### Shield

The colors green and gold, and the rampant lions have been adapted from a personal device of the Gallery family. The lions, symbolic of courage and strength, face in different directions indicating that the brothers for whom this ship is named, served in both theaters of operation during World War II. The star alludes to their many awards, and denote excellence and achievement. The crossed swords, adapted from the Officer and Enlisted badges, allude to Naval Combat Operations.

### Crest

Blue and gold are the colors traditionally associated with the Navy. The upraised arm in green and gold is an adaptation from the Gallery family device. The collared and chained sea-wolf symbolizes the only capture of a U-boat from the German wolf-packs during World War II. The crest also symbolizes the curbing and destruction of the enemy sub activities in the Pacific theatre.

### Motto

Manu Forti – “With a Strong Hand”

## 2.18.2 References

- [1] Wertheim, Eric, ed. (2007). "Egypt" . *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems* (15th ed.). Annapolis, Maryland: Naval Institute Press. p. 171. ISBN 978-1-59114-955-2. OCLC 140283156.
- [2] "USS Gallery (FFG 26)". Navsource.org. Retrieved April 11, 2015.
- [3] "USS Gallery (FFG 26)". Navysite.de. Retrieved April 11, 2015.

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## 2.18.3 External links

- MaritimeQuest USS Gallery FFG-26 pages
- GlobalSecurity.org FFG-26
- Photo gallery of USS *Gallery* (FFG-26) at NavSource Naval History

## 2.19 USS Mahlon S. Tisdale (FFG-27)

**USS Mahlon S. Tisdale (FFG-27)**, nineteenth ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Vice Admiral **Mahlon Street Tisdale** (1890–1972). Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California, on 23 January 1978 as part of the FY78 program, *Mahlon S. Tisdale* was laid down on 19 March 1980, launched on 7 February 1981, and commissioned on 27 November 1982.

*Mahlon S. Tisdale* (FFG-27) was the first ship of that name in the US Navy.

### 2.19.1 TCG *Gökçeada* (F 494)

Decommissioned on 27 September 1996 and stricken on 20 February 1998, she was transferred to Turkey on 5 April 1999 as that nation's TCG *Gökçeada* (F 494). As of 2013, she is still in active service.

## 2.19.2 References

- [1] "USS Mahlon S. Tisdale (FFG 27)". Navsource.org. Retrieved 11 April 2015.
- [2] "USS Mahlon S. Tisdale (FFG 27)". Navysite.de. Retrieved 11 April 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.19.3 External links

- MaritimeQuest USS *Mahlon S. Tisdale* FFG-27 pages
- GlobalSecurity.org FFG-27

## 2.20 USS Boone (FFG-28)

**USS Boone (FFG-28)** is the twentieth ship in the United States Navy's *Oliver Hazard Perry*-class of guided missile frigates.

The frigate was named for Vice Admiral **Joel Thompson Boone**, M.D. (1889–1974). FFG-28, the first U.S. ship to bear the admiral's name, was ordered 23 January 1978, launched 16 January 1980 by **Todd Pacific Shipyards**, and **commissioned** 15 May 1982. She has since earned numerous awards and commendations.

On 30 November 2006, the rudder fell off Mayport-based frigate *Boone* while on deployment in the western Mediterranean. The mishap forced the ship to send out a call for help to which Canadian destroyer **HMCS Iroquois** responded, providing divers who inspected the ship's underside. Within 24 hours, *Boone* was being towed to Rota for repairs by the German Navy's replenishment oiler **Spessart**. The ship was not adrift or totally dead in the water because its two 350-horsepower auxiliary propulsion units provided a "limited amount of maneuverability." The lost rudder was replaced 27 December and, after a day of operational testing, *Boone* got underway again on 28 December.\* [1]

*Boone* was assigned to Destroyer Squadron 14 and was the recipient of the 2005 DESRON 14 Battle "E". On 16 February 2007, she was awarded the 2006 Battle "E" award.\* [2]

*Boone* was homeported in Mayport, Florida, and was a member of the Navy Reserve. In March 2010, she was assigned to the United States Fifth Fleet fighting Somali piracy.

The last Commanding Officer of *Boone* was LCDR Robert Speight.\* [3]

*Boone* decommissioned 23 February 2012.

## 2.20.1 References

- [1] "November 30" . Seawaves.com. Retrieved April 11, 2015.
- [2] "Surface Force Ships, Crews Earn Battle "E"" . U.S. Navy. 2007-02-19. Retrieved 2013-05-28.

- [3] Dunham, Daniel N. (17 March 2014). "USS Boone (FFG 28)". Navsource Online. Retrieved 21 December 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.20.2 Further reading

- Milton F. Heller III (2000). *The Presidents' Doctor : An Insider's View of Three First Families*. Vantage Pr; 1st ed edition (August 2000). ISBN 0-533-13159-6.

## 2.20.3 External links

- [USS Boone Official site](#)
- [Photo gallery of USS Boone at NavSource Naval History](#)
- [navysite.de: USS Boone](#)
- [MaritimeQuest USS Boone FFG-28](#)

## 2.21 USS Stephen W. Groves (FFG-29)

For the *John C. Butler*-class destroyer escort, see [USS Groves \(DE-543\)](#).

**USS Stephen W. Groves (FFG-29)**, twenty-first ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Ensign Stephen W. Groves (1917–1942), a naval aviator who was posthumously awarded the Navy Cross for his heroism at the Battle of Midway during World War II.

### 2.21.1 Background

Ordered from Bath Iron Works, Bath, Maine, on 23 January 1978 as part of the FY78 program, *Stephen W. Groves* was laid down on 16 September 1980, launched on 4 April 1981, and commissioned on 17 April 1982, Commander Philip A. Bozzelli commanding.

*Stephen W. Groves* (FFG-29) is the first ship of that name in the U.S. Navy. A previous ship named for Ensign Groves, destroyer escort, *Groves* (DE-543), was canceled in 1944 prior to completion. Assigned to Destroyer Squadron 14 and home-ported at Naval Station Mayport, Florida, She was decommissioned on 24 February 2012.

### 2.21.2 History

On 28 August 2005, she sailed from her then-home port of Pascagoula, Mississippi, along with sister ship *John L. Hall* (FFG-32), under threat from Hurricane Katrina; Naval Station Pascagoula is now closed as a result of Hurricane Katrina.

Deployed to the Indian Ocean, on 10 May 2011 she met the Somali pirate longliner *Jih Chun Tsai* 68 after being ordered to intercept the hijacked Taiwanese fishing vessel. Receiving fire from the longliner, *Stephen W. Groves* engaged her in a single ship action that saw the pirate vessel sunk with 3 pirates killed, 2 wounded, and one Taiwanese hostage killed. Nineteen Somali pirates and two Chinese hostages were taken on board. The rescued Chinese crew were repatriated to China and their families.

\*[2]



*The Stephen W. Groves (FFG-29) as seen at sunset in Key West on 22 July 2007.*

She was also on station in the Desert Shield era when *Stark* (FFG-31) was struck by two missiles from an Iraqi fighter jet, and assisted *Stark* in her return to Mayport, Florida.

### 2.21.3 References

- [1] "USS Stephen W. Groves (FFG 29)". Navsource.org. Retrieved April 11, 2015.
- [2] <http://www.cusnc.navy.mil/articles/2011/082.html>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.21.4 External links

- [USS Stephen W. Groves official website](#)
- [Photo gallery of USS Stephen W. Groves \(FFG-29\) at NavSource Naval History](#)
- [navysite.de: USS Stephen W. Groves](#)
- [MaritimeQuest USS Stephen W. Groves FFG-29 pages](#)

## 2.22 USS Reid (FFG-30)

For other ships of the same name, see [USS Reid](#).

**USS Reid (FFG-30)**, twenty-second ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Sailing Master Samuel Chester Reid (1783–1861).

Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 23 January 1978 as part of the FY78 program, *Reid* was laid down on 8 October 1980, launched on 27 June 1981, sponsored by Mrs. William C. Abhau, her daughter Miss Elliot Abhau assisting, Mrs. Abhau is the great-great granddaughter of Sailing Master Chester Reid, and commissioned on 19 February 1983.

On 18 August 1990, *Reid* fired the first shots of Operation Desert Shield when she fired across the bow of an Iraqi tanker who had refused to change course when ordered.

The Reid's unofficial nickname *Reidski*, used during the 1980s, came into use as *Reid* found herself, more often than not, playing on the side of the "orange" team during fleet exercises.

### 2.22.1 TCG *Gelibolu* (F 493)

Decommissioned and stricken on 25 September 1998, she was transferred to [Turkey](#) on 5 January 1999 as that nation's TCG *Gelibolu* (F 493). As of 2013, she is still in active service.

### 2.22.2 References

- [1] "USS Reid (FFG 30)". Navysite.de. Retrieved April 11, 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.22.3 External links

- MaritimeQuest [USS Reid FFG-30 pages](#)
- Photo gallery of [USS Reid \(FFG-30\)](#) at NavSource Naval History

## 2.23 USS Stark (FFG-31)

**USS Stark (FFG-31)**, 23rd ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Admiral Harold Rainsford Stark (1880–1972). Ordered from Todd Pacific Shipyards, Seattle, Washington, on 23 January 1978, as part of the FY78 program, *Stark* was

laid down on 24 August 1979, launched on 30 May 1980, and commissioned on 23 October 1982, CDR Terence W. Costello commanding. In 1987, an Iraqi jet fired two missiles at *Stark*, killing 37 U.S. sailors on board. Decommissioned on 7 May 1999, *Stark* was scrapped in 2006.

### 2.23.1 Missile attack

Main article: [USS Stark incident](#)

USS *Stark* was deployed to the Middle East Force in 1984 and 1987. Captain Glenn R. Brindel was the commanding officer during the 1987 deployment. The ship was struck on 17 May 1987, by two Exocet anti-ship missiles fired from an Iraqi Mirage F1<sup>\*[3]\*[4]</sup> aircraft during the Iran–Iraq War. The plane had taken off from Shaibah at 8 pm and had flown south into the Persian Gulf. The pilot fired the first Exocet missile from a range of 22.5 nautical miles (41.7 km), and the second from 15.5 nautical miles (28.7 km), just about the time *Stark* issued a standard warning by radio.<sup>\*[5]</sup> The frigate did not detect the missiles with radar; warning was given by the lookout only moments before the missiles struck.<sup>\*[3]</sup> The first penetrated the port-side hull and failed to detonate, but left flaming rocket fuel in its path. The second entered at almost the same point, and, leaving a 3-by-4-meter gash, exploded in crew quarters. 37 sailors were killed and 21 were injured.<sup>\*[3]</sup>



Stark listing following two hits by Exocet missiles.

No weapons were fired in defense of *Stark*. The Phalanx CIWS remained in standby mode, Mark 36 SRBOC countermeasures were not armed until seconds before the missile hit. The attacking Exocet missiles and Mirage aircraft were in a blindspot of the STIR fire control director (Separate tracking and illumination Radar, part of the Mk 92 Guided Missile Fire Control System), and the Oto Melara Mk 75 76 mm/62 caliber naval gun, but in the clear for the MK 92 CAS (Combined Antenna System, primary search and tracking radar of the Mk 92 Guided Missile Fire Control System) and the Mk 13 Mod 4 single-arm launcher. The ship failed to maneuver to bring its Mk 75 to bear before the first missile hit.<sup>\*[3]</sup>

On fire and listing, the frigate was brought under control by its crew during the night. The ship made its way to Bahrain where, after temporary repairs by the tender USS *Acadia* to make her seaworthy,\*[6] she returned to her home port of Mayport, Florida, under her own power. The ship was eventually repaired at Ingalls Shipbuilding in Mississippi for \$142 million.



*A view of external damage to the port side.*

It is unknown whether Iraqi leaders authorized the attack. Initial claims by the Iraqi government (that *Stark* was inside the Iran–Iraq War zone) were shown to be false. The motives and orders of the pilot remain unanswered. American officials have claimed he was executed, but an ex-Iraqi Air Force commander later said that the pilot who attacked *Stark* was not punished, and remained alive.\*[7]

Citing lapses in training requirements and lax procedures, the U.S. Navy's board of inquiry relieved Captain Brindel of command and recommended him for court-martial, along with Tactical Action Officer Lieutenant Basil E. Moncrief. Instead, Brindel and Moncrief received non-judicial punishment from Admiral Frank B. Kelso II and letters of reprimand. Both opted for early retirement, while Executive Officer Lieutenant Commander Raymond Gajan Jr. was detached for cause and received a letter of admonition.\*[8]

## 2.23.2 1990s

*Stark* was part of the Standing Naval Forces Atlantic Fleet in 1990 before returning to the Middle East Force in 1991. She was attached to UNITAS in 1993 and took part in Operation Support Democracy and Operation Able Vigil in 1994. In 1995, she returned to the Middle East Force before serving with the Standing Naval Forces, Atlantic (STANAVFORLANT) in 1997 and in 1998.

*Stark* was decommissioned on 7 May 1999. A scrapping contract was awarded to Metro Machine Corp. of Philadelphia, Pennsylvania, on 7 October 2005. The ship was reported scrapped on 21 June 2006.\*[9]

## 2.23.3 References

- [1] "USS Stark (FFG 31)". Navsource.org. Retrieved April 11, 2015.
- [2] "USS Stark (FFG 31)". Navysite.de. Retrieved April 11, 2015.
- [3] Formal Investigation into the Circumstances Surrounding the Attack of the USS Stark in 1987
- [4] Desert Storm at sea: what the Navy really did by Marvin Pokrant, p. 43.
- [5] Stephen Andrew Kelley (June 2007). "Better Lucky Than Good: Operation Earnest Will as Gunboat Diplomacy" (PDF). Naval Postgraduate School. Retrieved 9 November 2007.
- [6] <http://headmuscle.wordpress.com/2010/05/31/a-stark-reminder-2/>
- [7] Fisk, Robert (2005). *The Great War For Civilisation: The Conquest of the Middle East*. Knopf Publishing.
- [8] Cushman Jr, John H. (28 July 1987). "Navy Forgoes Courts-Martial for Officers of Stark". *The New York Times*.
- [9] Naval Vessel Register. STARK (FFG 31). Retrieved 4 April 2007.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.23.4 Further reading

- Levinson, Jeffrey L. and Randy L. Edwards (1997). *Missile Inbound*. Annapolis: Naval Institute Press. ISBN 1-55750-517-9.
- Wise, Harold Lee (2007). *Inside the Danger Zone: The U.S. Military in the Persian Gulf 1987–88*. Annapolis: Naval Institute Press. ISBN 1-59114-970-3.
- United States. Congress. House. Committee on Armed Services (1987). *Report on the Staff Investigation into the Iraqi Attack on the USS Stark of the Committee on Armed Services, House of Representatives, One Hundredth Congress, First Session*. Washington, D.C.: U.S. Government Printing Office.

## 2.23.5 External links

- Photos of the damaged *Stark*
- Host page for PDF version of report: Formal Investigation into the Circumstances Surrounding the Attack of the USS *Stark* in 1987

- US Navy's Damage Control Museum page on the *USS Stark*
- Photo gallery of *USS Stark* (FFG-31) at NavSource Naval History
- Information on Operation Earnest Will
- MaritimeQuest *USS Stark* FFG-31 pages
- NPR's interview with OS2 Gable. Aired 15 May 2008.
- NPR's interview with Michael Tooker. Aired 9 June 2008.

## 2.24 USS John L. Hall (FFG-32)

**USS John L. Hall (FFG-32)**, twenty-fourth ship of the *Oliver Hazard Perry* class of guided-missile frigates, was named for Admiral John L. Hall, Jr. (1891–1978).

Ordered from Bath Iron Works, Bath, Maine, on 23 January 1978 as part of the FY78 program, *John L. Hall* was laid down on 5 January 1981, launched on 24 July 1981, and commissioned on 26 June 1982.

On 28 August 2005, under the command of Commander David Geisler, she sailed from her home port, NS Pascagoula, Mississippi, along with sister ship *Stephen W. Groves* under threat from Hurricane Katrina.

In 2007, she remained active, commanded by Commander Augustus P. Bennet, assigned to Destroyer Squadron 14, and homeported at NAVSTA Mayport, Florida. In August 2008, while underway to avoid Tropical Storm Fay, the scheduled change of command occurred with Commander Derek Lavan assuming command of the vessel.

21 April 2010, seen docked in Sevastopol (UA).<sup>\*[2]</sup>

On 22 June 2010, then CO Commander Herman Pfaeffle was relieved of command after striking a pier on 16 April 2010 in Batumi in the republic of Georgia.<sup>\*[3]</sup>

In 9 March 2012, the *John L. Hall* was decommissioned at Naval Station Mayport.

In November 2012 she was still at the Philadelphia Navy Yard.

### 2.24.1 References

- [1] "USS John L. Hall (FFG 32)". Navsource.org. Retrieved April 11, 2015.
- [2] <http://news.tochka.net/43112-lyudi-vitrenko-obrugali-natovskiy-korabl-foto>
- [3] <http://www.navytimes.com/news/2010/09/navy-David-Solms-relieved-091410/>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

### 2.24.2 External links

- Photo gallery of *USS John L. Hall* (FFG-32) at NavSource Naval History
- MaritimeQuest *USS John L. Hall* FFG-32 pages

## 2.25 USS Jarrett (FFG-33)

**USS Jarrett (FFG-33)**, was the twenty-fifth ship of the *Oliver Hazard Perry*-class guided missile frigates, was named for Vice Admiral Harry B. Jarrett (1898–1974).

Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 23 January 1978 as part of the FY78 program, *Jarrett* was laid down on 11 February 1981, launched on 17 October 1981, commissioned on 2 July 1983, and decommissioned on 21 April 2011.

*Jarrett* was the first US Navy warship to be commanded by a woman, Commander Kathleen A. McGrath, from 18 December 1998 until 4 September 2000.<sup>\*[1]\*[2]\*[3]</sup>

### 2.25.1 Service History

#### 12 May—12 November 1987

During a deployment to the Western Pacific, Indian Ocean, and Persian Gulf, *Jarrett*, Commander Leslie S. Blankinship in command, took part in Operation Earnest Will, an operation to maintain freedom of navigation within the Persian Gulf, that included renaming and reflagging 11 Kuwaiti tankers. During the "Tanker War" between the Iranians and Iraqis, the Iranians utilized 1,662 ton former South Korean roll-on, roll-off vessel *Iran Ajr*, Lt. Cmdr. Parviz [Mohammad] Farshchiyan in command, to lay mines to cut the sea lanes to Iraq.<sup>\*[4]</sup>

*Iran Ajr* stopped overnight on 21 September 1987, at a two-towered rig named *Rashadat* in the Rastam gas-oil separation platform (GOSP) complex, 120 miles east of Bahrain. The rig had been shut down for almost two years following Iraqi discovery that the Iranians used *Rashadat* for radar tracking of ships and for launching small boats. *Iran Ajr* turned toward the tanker routes, but just before midnight three Army helicopters, consisting of a Boeing MH-6 "Little Bird" and a pair of AH-6 "Sea Bats" of the 160th Special Operations Aviation Regiment (Airborne), at least one of the helos flew from *Jarrett*, surprised the minelayer 50 miles northeast of Bahrain.<sup>\*[4]</sup>

President Ronald W. Reagan later announced that *Iran Ajr* posed "a direct threat to the safety of U.S. warships and other U.S.-flag vessels." The Iranian ship began to lay

mines in an area where Middle East Force (MEF) flagship *La Salle* (AGF-3) sailed, and when reporters afterward queried Rear Admiral Harold J. Bernsen, Commander MEF, about the Iranians' intent to sink the flagship he replied, "Absolutely." At 2302 therefore, the Army helos announced "inbound hot" and attacked the Iranian ship into the mid watch, damaging her with 2.75 in (70 mm) rockets and 7.62 mm (0.30 in) M134 Minigun fire, and killing at least four crewmen.\* [4]

*La Salle*, amphibious assault ship *Guadalcanal* (LPH-7), guided missile cruisers *Reeves* (CG-24) and *William H. Standley* (CG-32), guided missile destroyer *Kidd* (DDG-993), and guided missile frigates *Flatley* (FFG-21) and *Jarrett* made for the area. Men of Sea, Air, Land (SEAL) Team 2, Commander Marc Thomas officer-in-charge, backed-up by two Marine helos, boarded and captured the ship from a landing craft during the morning watch. The boarders gathered 24 survivors on board or from the water (one later died), impounded the minelayer, photographed evidence, and located at least nine remaining mines. The prisoners were later returned to Iran.\* [4]

### 7 December 1990–6 June 1991

During a deployment to the Western Pacific, Indian Ocean, and Persian Gulf, *Jarrett*, Commander William L. Snyder in command, with two Sikorsky SH-60B Sea-hawks of Helicopter Antisubmarine Squadron (Light) (HSL)-45 Detachment 2 embarked, Lt. Cmdr. Thomas M. Cirillo, officer-in-charge, took part in the Persian Gulf War I. During the coalition air attacks in Operation Desert Storm, many Iraqi jets fled to Iran. Following *Jarrett*'s arrival in the Persian Gulf on 25 January 1991, she consequently operated as an antiair picket off the Iranian coast (3–11 February).\* [4]

The ship then embarked two Army Bell OH-58D "Kiowas" and 13 soldiers of B Troop, 4th Squadron, 17th Cavalry Regiment (Air) (Reconnaissance), 18th Aviation Brigade (Corps) (Airborne), Captain Robert M. Cumbie, USA, in command. On 16 February 1991, the "Kiowas" flew a night coastal reconnaissance flight, and *Jarrett* redirected them approximately 40 miles north to assess bomb damage on an Iraqi HY-2G "Silkworm" (CSS-C-2 Sea Eagle-2) surface-to-surface missile site. Navy Grumman A-6E "Intruders" bombed the site, but the helos discovered that the "Intruders" failed to destroy the Silkworms, and carrier jets bombed them again.\* [4]

The two helicopters refueled on board *Jarrett* and lifted off, equipped with AGM-114 Hellfire air-to-ground missiles. Battleship *Missouri* operated an AAI RQ-2 Pioneer remotely piloted vehicle (RPV) subsequently designated an unmanned aerial vehicle (UAV) that helped the battleship direct her naval gunfire support of the troops fighting ashore. Crewmen launched the Pioneer with the assistance of a rocket-powered booster, and recovered the aircraft by utilizing a net strung between two cables

on the fantail. The vehicle transmitted images to shipboard TV monitors that enabled men to "walk" rounds onto their targets. The Pioneer revealed that at least one Iraqi missile survived the second bombing, and one of the "Kiowas" launched a Hellfire that destroyed the Silkworm.\* [4]

*Jarrett* passed through areas swept clear of mines off the Kuwaiti coast and joined British destroyer *Gloucester* and frigate *London* while they protected *Missouri* as the battleship shelled enemy troops ashore. An Iraqi battery at al-Fintās fired two Silkworms at the formation of allied ships, at 0452 on 25 February 1991. One of the Silkworms splashed into the sea shortly after the Iraqis launched it, but the other missile hurtled toward *Missouri* at 605 knots and a height of 375 feet above the water. The U.S. and British ships tracked the incoming missile on their radar, and *Jarrett* and an airborne "Seahawk" launched chaff, torchs, and ducks to confound the missile's guidance.\* [4] *Missouri* also fired its SRBOC chaff at this time. The Phalanx CIWS system on *Jarrett*, operating in the automatic target-acquisition mode, fixed on *Missouri*'s chaff, releasing a burst of rounds. From this burst, four rounds hit *Missouri* which was 2–3 miles (3.2–4.8 km) from *Jarrett* at the time. There were no injuries.\* [5] *Gloucester* shot down the missile with two Sea Dart surface-to-air missiles. *Missouri* launched a Pioneer that discovered the Iraqi Silkworm battery and the battleship fired about 30 16-inch rounds and knocked out the battery. After the cease fire, *Jarrett* escorted merchant ships through "mine danger areas" (1 March–14 April).\* [4]

### 31 January 2000

Alaska Airlines Flight 261, a McDonnell Douglas MD-83 airliner, crashed into the Pacific north of Anacapa Island, California, killing all 88 people on board, on 31 January 2000. A Lockheed NP-3D Orion from Point Mugu, California, two Sikorsky HH-60H Seahawks from Helicopter Sea Combat Squadron (HCS) 5 from Point Mugu, and Coast Guard helos and a Lockheed HC-130H Hercules responded. Aircraft carrier *Abraham Lincoln* supported rescue crews, and Navy mapping with underwater side scanning sonar and video enabled the searchers to recover pieces of wreckage. Reinforcements included amphibious transport dock *Cleveland*, destroyer *Fife* and *Jarrett*, these ships embarked HH-60 and SH-60 Sea-hawks, and a Lockheed S-3B Viking from Naval Air Station North Island.\* [4]

### 11 May–19 October 2009

The ship, with HSL-49 Detachment 3 and Pacific Tactical Law Enforcement Detachment 101 embarked (followed by 107), sailed on a counter-narcotics deployment to the Eastern Pacific. Her operations resulted in the seizure or

disruption of the smuggling of over nine tons of narcotics with an estimated street value of \$266 million.\* [4]

### 2.25.2 Current status

On 21 April 2011, *Jarrett* was decommissioned at Naval Base San Diego after 15 deployments, and was transported to the Puget Sound Naval Shipyard as its final destination, becoming part of the Mothball Fleet. The ship's most recent deployment was a six-month counter-illicit trafficking deployment, supporting U.S. Naval Forces Southern Command.\* [6]

*Jarrett* was the first ship of that name in the US Navy.

### 2.25.3 References

- [1] [http://www.news.navy.mil/search/display.asp?story\\_id=8392](http://www.news.navy.mil/search/display.asp?story_id=8392)
- [2] Previous Commanding Officers of USS Jarrett at the Wayback Machine (archived May 5, 2006)
- [3] <http://arlingtoncemetary.net/kmcgrath.htm>
- [4] "Jarrett (FFG-33)". Naval History and Heritage Command. 22 July 2015. Retrieved 22 December 2015.
- [5] "Tab-H Friendly-fire Incidents". Gulflink.osd.mil. 2000-12-13. Retrieved 2014-10-21.
- [6] [http://www.navy.mil/search/display.asp?story\\_id=59940](http://www.navy.mil/search/display.asp?story_id=59940)

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### 2.25.4 External links

Photo gallery of USS *Jarrett* (FFG-33) at NavSource Naval History

- Official website: USS *Jarrett* at the Wayback Machine (archived January 17, 2011)
- MaritimeQuest USS *Jarrett* FFG-33 pages
- GlobalSecurity.org FFG-33

## 2.26 USS *Aubrey Fitch* (FFG-34)

**USS *Aubrey Fitch* (FFG-34)**, the twenty-sixth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for Vice-Admiral *Aubrey Fitch* (1883–1978),

who was noted for his outstanding command work in the South Pacific during World War II.

Ordered on 23 January 1978, as a part of the FY-1978 program, *Aubrey Fitch* was laid down on 10 April 1981 at the Bath Iron Works, Bath, Maine. She was launched on 17 October 1981—sponsored by Mrs. Francesca Fitch Ferguson, the granddaughter of the late Admiral Fitch—and was commissioned at Bath, Maine, on 9 October 1982, with Commander Floyd A. Weeks in command.\* [3]

This warship was decommissioned on 12 December 1997 and stricken from the Navy's list on 3 May 1999.

### 2.26.1 1982

After commissioning, *Aubrey Fitch* remained at Bath for another five weeks completing her outfitting, propulsion plant testing, and sailors' training. In mid-November, she made the passage from Bath to her home port, Mayport, Florida, where she spent the remainder of 1982.\* [3] She was the final "Short-Hull" *Oliver Hazard Perry*-class guided-missile frigate to be built, the rest were "Long-Hulls".

### 2.26.2 1983

Early in January 1983, the guided-missile frigate embarked upon her shakedown cruise to the vicinity of Guantanamo Bay, Cuba. The warship returned to Mayport during the middle of February and then launched into a series of trials, qualifications, and certifications preparatory to her final acceptance by the Navy. She completed final acceptance trials late in May and entered the yard at Bath Iron Works for a three-month, post-shakedown availability. *Aubrey Fitch* completed repairs and returned to Mayport in September. In October, she commenced refresher training out of Guantanamo Bay.\* [3]

The guided-missile frigate was so engaged when United States military forces invaded the small Caribbean island nation of Grenada on 25 October in response to a power struggle between leftist factions that endangered the stability of the region as well as the lives of United States citizens attending the medical college there. *Aubrey Fitch* interrupted refresher training to conduct patrols in defense of the base at Guantanamo Bay against possible hostile action by Cuba as a result of the conflict in Grenada where Americans found themselves fighting Cuban "advisors" and "construction workers".\* [3]

Early in November, however the warship completed refresher training and assumed tactical control of *Aquila* and *Taurus* for the purpose of testing the feasibility of operating guided-missile frigates and guided-missile hydrofoil gunboats together in the same task organization. Demands attendant to the continuing American presence in Grenada, however, overtook the experiment and sent

*Aubrey Fitch* and her two consorts south to the tiny republic. Duty in the waters adjacent to Grenada lasted until mid-December when the warship returned to Mayport.\*[3]

### 2.26.3 1984

*Aubrey Fitch* began 1984 in her home port. Later in January, she embarked upon a normal schedule of training operations in the West Indies. That employment occupied her through the month of May and into June. On 22 June, the guided missile frigate put to sea to become a unit of NATO's Standing Naval Force, Atlantic, based at Plymouth, England. That deployment included visits to a number of ports in northern Europe as well as training evolutions in the Baltic Sea. Early in the fall of 1984, the NATO force visited American waters and made calls at Charleston, Savannah, and New Orleans. Late in November, the warships visited *Aubrey Fitch*'s home port in Florida. Early in December, the NATO force headed back to Europe, leaving *Aubrey Fitch* at Mayport.\*[3]

### 2.26.4 1985

The warship opened 1985 much the same way as she did 1984. After concluding holiday leave and upkeep at Mayport during the first half of January, she returned to sea for the usual training exercises, equipment operation certifications, and ASW helicopter landing qualifications. These and similar evolutions alternated with periods in port for routine upkeep and availability occupied her time during the first five months of the year. In June, *Aubrey Fitch* began providing escort and plane guard services for *America* and *Saratoga* when the carriers put to sea to conduct landing qualifications.\*[3]

Near the end of June, she put to sea for special operations off the west coast of the Isthmus of Panama. She transited the Panama Canal and then operated from the base at Rodman, Panama during July, August, and part of September. After passing back through the canal in mid-September, *Aubrey Fitch* arrived back at Mayport on the 21st. Repairs took up the remainder of September as well as October and November. She concluded her restricted availability with sea trials on 5 and 6 December and, after a brief round trip to Charleston and back, settled into the usual year-end holiday routine.\*[3]

### 2.26.5 1986

The relative inactivity of holiday standdown carried over into the first three weeks of 1986. On 21 January, *Aubrey Fitch* put to sea for a week of ASW training in the Bahama Islands. On 28 January, she interrupted her return voyage when the Space Shuttle *Challenger* disintegrated soon after launch. From her position just 50 miles southeast of

Cape Canaveral *Aubrey Fitch* rushed to the scene of the tragedy and began recovering debris. She collected several tons of material which she later delivered to Cape Canaveral to be inspected as a part of the investigation into the cause of the disaster. From Cape Canaveral the guided-missile frigate returned to Mayport and remained there until the second week in February. On 10 February, *Aubrey Fitch* resumed training operations out of Mayport, and she continued so employed until the beginning of April at which time the warship began preparations to deploy to the Persian Gulf.\*[3]

On 4 June, *Aubrey Fitch* stood out of Mayport in company with the frigate *Talbot* to rendezvous with the destroyers *Nicholson* and *Semmes*. She and her traveling companions then laid in a course that took them across the Atlantic Ocean and the Mediterranean Sea, through the Suez Canal, and around the Arabian Peninsula to the Strait of Hormuz. *Aubrey Fitch* and her consorts arrived at Bahrain in the Persian Gulf on 8 July. The guided-missile frigate spent the next four months conducting patrols and escorting merchant ships in the strategic—and troubled—waters of the Persian Gulf, the Gulf of Oman, and the northern portion of the Arabian Sea. No untoward events marred her sojourn in the region, and she concluded her assignment on 30 October by turning her responsibilities over to the destroyer *USS Sampson*. Retracing her outward-bound voyage via the Red Sea, the Suez Canal, the Mediterranean Sea, and the Atlantic Ocean, *Aubrey Fitch* steamed into Mayport on 4 December. Post-deployment standdown took up the remainder of 1986.\*[3]

### 2.26.6 1987–1997

Over the next ten years, *Aubrey Fitch* continued to the Middle East and the West Indies. During a 1988 deployment to the Persian Gulf, the frigate participated in Operation Earnest Will, during which she conducted escort missions to protect Kuwaiti merchant tankers from attack during the Iran-Iraq War. In December 1990 the warship conducted counter-narcotics patrols in the Caribbean and eastern Pacific, and received a Joint Meritorious Unit Award for her efforts. In July 1991, *Aubrey Fitch* hosted the Soviet guided missile destroyer *Simferopol* during a visit to Mayport.\*[3]

In August 1991, following the invasion of Kuwait by Saddam Hussein's Iraqi Army, the frigate surged to the Middle East to participate in Maritime Interception Operations (MIO) in the northern Red Sea. Designed to cut the flow of supplies and equipment to Iraq in support of United Nations' economic sanctions, *Aubrey Fitch* conducted 243 merchant ship boardings and inspected over 3 million tons of cargo. The ship received a Navy Meritorious Unit Commendation for this performance.\*[3]

In February 1993 the frigate participated in Operation Able Manner, in support of migration interdiction efforts

off Haiti, receiving the Coast Guard Special Operations Service Ribbon for developing baseline procedures for conducting mass lifesaving operations.\*[3]

In 1994, *Aubrey Fitch* carried out two deployments to Haiti in support of Operation Uphold Democracy, where the crew boarded over 50 ships to enforce economic sanctions against the government and provided security and search-and-rescue support for operations within Port-au-Prince Harbor.\*[3]

In the summer of 1995, the frigate sailed to Europe both to conduct NATO training exercises and to participate in the 50th anniversary commemoration of the Battle of the Atlantic and the end of the war in Europe.\*[3]

*Aubrey Fitch* spent March through July 1995 touring Western Europe, including Bermuda; Brest, France; Rota, Barcelona and Ibiza, Spain; Casablanca, Morocco; Gibraltar, Portsmouth & Liverpool, UK; Lisbon, Portugal; Amsterdam, Netherlands; Derry & Portrush, Northern Ireland and Rosyth, Scotland.

From September 1996 to March 1997, *Aubrey Fitch* conducted her last operational deployment as part of Standing Naval Force Atlantic, during which she visited fourteen ports ranging between Gdynia, Poland west to Faslane, Scotland and south to Lisbon, Portugal.\*[3]

*Aubrey Fitch* was decommissioned on 12 December 1997 and towed to the former Philadelphia Naval Yard as part of the inactive reserve fleet. She had the shortest active career of any of the US Navy's Oliver Hazard Perry-class ships at 15 years, and was stricken on 3 May 1999, just two years later into unmaintained (Category-X) status to await scrap sale. *Aubrey Fitch* was transferred to Metro Machine Corp. for scrapping, on 26 March 2004.

*Aubrey Fitch* (FFG-34) was the first ship with this name in the U.S. Navy.

## 2.26.7 References

- [1] "USS Aubrey Fitch (FFG 34)". Navsource.org. Retrieved April 11, 2015.
- [2] "USS Aubrey Fitch (FFG 34)". Navysite.de. Retrieved April 11, 2015.
- [3] "Aubrey Fitch". Naval History and Heritage Command. 19 June 2015. Retrieved 22 December 2015.

This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#). This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).

## 2.26.8 External links

Photo gallery of USS *Aubrey Fitch* (FFG-34) at Nav-

Source Naval History

- [hazegray.org/danfs/](http://hazegray.org/danfs/): USS *Aubrey Fitch*
- [MaritimeQuest](http://MaritimeQuest.com) USS *Aubrey Fitch* FFG-34
- [GlobalSecurity.org](http://GlobalSecurity.org) FFG-27

## 2.27 USS Underwood (FFG-36)

**USS Underwood (FFG-36)** was the twenty-seventh ship of the *Oliver Hazard Perry*-class of guided-missile frigates, named for Captain Gordon Waite Underwood (1910–1978).

Ordered from Bath Iron Works, Bath, Maine, on 27 April 1979 as part of the FY79 program, *Underwood* was laid down on 30 July 1981, launched on 6 February 1982, and commissioned on 29 January 1983. She was assigned to Destroyer Squadron 14 and homeported at Mayport, FL.

On 13 January 2010, *Underwood* was ordered to assist in the humanitarian relief efforts following the 2010 Haiti earthquake.\*[1]

*Underwood* was extensively used to counteract drug trafficking in Latin America with the assistance of the Coast Guard.\*[2]

*Underwood* was decommissioned on March 8, 2013.\*[3]



Underwood passing under the Cape Cod Canal Railroad Bridge, June 2006

## 2.27.1 References

- [1] Bacon, Lance M. (13 January 2010). "Carl Vinson, 6 Other Ships Headed to Haiti". Navy Times. Retrieved 13 January 2010.
- [2] "America's Expanding War On Drugs In Latin America". Huffington Post. 3 February 2013.
- [3] <http://www.navytimes.com/news/2012/03/navy-11-ships-to-be-decommissioned-in-fiscal-2013-031412w/>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.27.2 External links

Photo gallery of USS Underwood (FFG-36) at NavSource Naval History

- Official website
- MaritimeQuest USS Underwood FFG-36 pages
- GlobalSecurity.org FFG-36

## 2.28 USS Crommelin (FFG-37)

**USS Crommelin (FFG-37)**, twenty-eighth ship of the *Oliver Hazard Perry*-class of guided-missile frigates, was named for five brothers: Rear Admiral John G. Crommelin (1902–1996), Vice Admiral Henry Crommelin (1904–1971), Commander Charles L. Crommelin (1909–1945), Lieutenant Commander Richard Crommelin (1917–1945), and Captain Quentin C. Crommelin (1919–1997). The Crommelin brothers were the only five siblings ever to graduate from the United States Naval Academy. Four of them became pilots, and Time magazine dubbed them “The Indestructibles.” The brothers saw action in more than ten campaigns in the Pacific Theater. Henry, the oldest, became a Surface Warfare Officer while Richard and Charles died in combat as naval aviators in 1945. Individually and as a fighting family, they gained fame in World War II, attaining outstanding combat records and multiple decorations.\*[1] *Crommelin* (FFG-37) is the first ship of that name in the United States Navy.



The Crommelin brothers.

Ordered from Todd Pacific Shipyard, Seattle, Washington on 27 April 1979 as part of the Fiscal year 1979 program, *Crommelin* was laid down on 30 May 1980,

launched on 2 July 1981, and commissioned on 18 June 1983.

After three decades of service, *Crommelin* was decommissioned in a ceremony at Pearl Harbor, October 26, 2012. It had rescued 96 people from the high seas and seized roughly \$1.25 billion worth of cocaine over its lifetime.

## 2.28.1 Operational history

*Crommelin* was assigned to Destroyer Squadron 9 and reached its homeport of Long Beach, California in August 1983. Underway from Long Beach on 1 October 1984 to join Battle Group 'DELTA' for COMPTUEX 85-1, HSL-41, Detachment ONE embarked.

On 14 January 1985, the ship was underway from San Diego for READIEX 85-1, the second major fleet exercise for LAMPS MK III, Helicopter Anti-Submarine Squadron Light, Four Three, Detachment ONE embarked USS *Crommelin*. At sea commander of Battle Group DELTA, Rear Admiral Leon A Edney, USN, Commander Carrier Group One, embarked aboard **USS Constellation** (CV-64). Later that year Battle Group Delta, the *Constellation* Battle Group, deployed to the western Pacific and Indian Oceans. During this deployment, *Crommelin* became the first FFG to successfully engage a high-speed, maneuvering target with missiles. Just before reaching Naval Station Subic Bay, the Philippines, *Crommelin* changed command in the presence of Commander, Carrier Group One, and Commander, Destroyer Squadron 17. It was also the first ship to complete an operational deployment with the LAMPS MK III weapon system. In June 1986, *Crommelin* received the first Chief of Naval Operations LAMPS MK III Safety Award.

In the summer of 1986, *Crommelin* was awarded every departmental and divisional excellence award and won its first Navy "E" award. In 1987, *Crommelin* was assigned to Destroyer Squadron 13 and began an accelerated deployment with *Constellation* battle group. *Crommelin* was the first FFG to deploy with two LAMPS MK III helicopters embarked. *Crommelin* was assigned to Commander, Middle East Force from 1 July to 25 August 1987, earning a Meritorious Unit Commendation and Armed Forces Expeditionary Medal for the convoy escort of the first five reflagged Kuwaiti tankers in Operation Earnest Will.

On 1 January 1988, *Crommelin* was reassigned to Destroyer Squadron 9, and on 6 March 1988, the ship received a second consecutive Navy "E" award. Upon completion of its second availability period at Todd Pacific Shipyard, *Crommelin* was deployed in March 1989 again to the Persian Gulf. In October 1990 *Crommelin* was deployed in support of joint service, counter-narcotics operations in the Central, South American, and Caribbean theater. *Crommelin* was awarded the Joint Services Meritorious Unit Award for its performance during

this deployment. In 1991, *Crommelin* received the Navy “E” as well as its fifth consecutive warfare excellence awards for anti-air and anti-surface warfare, navigation and seamanship, damage control, engineering, and communications. On 1 September 1991, *Crommelin* shifted homeports to Pearl Harbor, Hawaii, and joined Destroyer Squadron 31.

*Crommelin* completed a second four-month counter-narcotics deployment in the Central, South American and Caribbean theater from November 1992 to March 1993. Upon return to its homeport of Pearl Harbor, Hawaii, *Crommelin* was assigned to Commander Naval Surface Group, Middle Pacific.

From 6 July to 14 December 1994, *Crommelin* was assigned to the *Kitty Hawk* battle group in the Western Pacific for Korean contingency operations. There, *Crommelin* received the Meritorious Unit Commendation Award for the prosecution of a Chinese Han class submarine. Upon completion of this deployment she underwent dry-docking SRA-5 at Pearl Harbor Naval Shipyard, following which she began the cycle for her 1996 Western Pacific deployment with the USS *Carl Vinson* battle group.

After a three-month work up cycle, *Crommelin* deployed with the *Carl Vinson* battle group on 20 May 1996. This deployment took *Crommelin* and her crew back to the Persian Gulf for a variety of missions, including escorting ships through the Straits of Hormuz, patrolling the Northern Persian Gulf, and conducting maritime interception operations. *Crommelin* returned from that deployment on 20 November 1996.

Following WESTPAC 96, *Crommelin* entered SRA-6 from January to March 1997. *Crommelin* received upgrades to all major weapons systems as well as the engineering plant. Following this availability, *Crommelin* and her crew began yet another work up cycle to prepare for her fifth deployment to the Persian Gulf as part of the U.S. 5th Fleet. *Crommelin* departed Pearl Harbor on 21 February 1998. During this deployment *Crommelin* distinguished herself by setting a Fifth Fleet record for number of vessels boarded and tonnage of illegal Iraqi petroleum seized and diverted.

*Crommelin* completed a demanding nine week private sector SRA in early 1999, where she made major repairs and upgrades throughout the ship. Immediately following the SRA, *Crommelin* aggressively entered the inter-deployment training cycle and proceeded to set numerous records throughout her training. Chief among these was condensing what is normally a twelve-week training cycle into nine weeks. Other achievements were completing cruise missile test qualification on the first day of training and completing engineering qualification with 100% of drills and 28 of 29 evolutions graded as “satisfactory”.

With her training cycle complete, *Crommelin* departed Pearl Harbor on 24 August 1999 for a three-month deployment to the Eastern Pacific in support of counter nar-

cotics operations. During this deployment, *Crommelin* steamed 77 of 92 days, flew more than 350 mishap-free SH-60B flight hours, and was a key player in four major cocaine seizures. Upon her return to Pearl Harbor on 24 November 1999, *Crommelin* immediately began the work up cycle for her next deployment with USS *Abraham Lincoln* battle group in August 2000.

In February 2000, *Crommelin* was awarded the Battle “E” for Destroyer Squadron 31 as well as each of the four command excellence awards. Other accomplishments included the 1999 Commander in Chief, Pacific Fleet Retention Excellence Award, 1999, Commander Naval Surface Forces Pacific (COMNAVSURFPAC) Surface Ship Safety Award, COMNAVSURFPAC Self-Sufficient Ship of the Quarter Award (Q4 FY99 and Q2 FY00), and the distinction of being the first Pearl Harbor ship to hoist the Enlisted Surface Warfare Specialist Pennant.

During WESTPAC 2000, eighteen non-compliant vessels were boarded by *Crommelin*'s Visit Board Search and Seizure Team, twelve were found to be smuggling petroleum products from Iraq and diverted to friendly ports for disposal of the ships and their illegal cargo. On the eve of the homecoming from deployment, *Crommelin* received her second consecutive Battle Efficiency Award.

From 18 April 2001 to June 2001, *Crommelin* was dry-docked at Pearl Harbor Naval Shipyard for Dry-dock Selected Restricted Availability. In January 2002 *Crommelin* received the 2001 COMNAVSURFPAC Surface Ship Safety Award.



*Crommelin* outward bound past Diamond Head, May 2004.

From 12 May 2004 to 12 November 2004, *Crommelin* was deployed to the SOUTHPAC AOR with Coast Guard Law Enforcement Detachment (LEDET) 105 in support of the war on drugs, conducting counter-narcotics operations in the Pacific Ocean and Caribbean Sea. In that time, she became the most second most successful counter-narcotics ship with the seizure of 44,806 lb (20,324 kg) of cocaine, including 26,369 pounds from the Belize-flagged vessel San Jose on 23 September 2004. She held that record until the bust of the Panamanian flagged motor vessel Gatun off the coast of Panama in March 2007, carrying approximately 42,845 lb (19,434 kg) of cocaine.\* [2] During this deployment, America's



Crommelin with an Argentine Navy P-3 Orion during joint operations at the Panama Canal.



A US Coast Guard C-130 flies overhead with the *FSM* patrol boat Independence in the foreground.

Battle Frigate also participated in exercises UNITAS-04 and PANAMAX-04, training the Navies and Coast Guards of various Central- and South-American countries in counter-narcotics and counter-terrorism tactics at sea.

From 5 May 2006 to 15 September 2006, she participated in CARAT-06, along with *Salvor*, *Tortuga*, *Hopper* and *USCGC Sherman*. In that time, Task Group 73.1 trained the Navies of several Southeast Asian countries in Maritime boarding and counter-terrorism tactics. Upon returning to home port, she entered an intensive dry dock period and as of May 2007, is preparing herself for continued operations in the wars on terror and drugs.

In November 2007 *Crommelin* Deployed to the Southcom AOR insupport of CounterNarco-Terroism Ops (CNT-OPS). On Christmas Eve 2007 *Crommelin* stopped a 'go-fast' drug runner near the coast of Columbia carrying 5,200 lbs of cocaine. *Crommelin* boarded close to 20 vessels involved in drug running operations during her 7-month deployment. Nearing the end of the deployment the frigate was awaiting the arrival of *USS George Washington* (CVN-73) into the Eastern Pacific AOR for a re-fueling operation. As the 2 ships came alongside each other *George Washington* had a major fire break out on-board damaging 92 spaces within as well as shutting down part of their nuclear reactor. She quickly made for San Diego to conduct repairs while *Crommelin* was left short on food and even lower on fuel. The frigate had to make an emergency stop in Mexico to refuel both food and fuel to make it back to Hawaii in June 2008. After a successful deployment *Crommelin* entered dry dock in October 2008 for repairs to keep her operational throughout the next decade. In 2010, *Crommelin* was again awarded the Battle "E" for Destroyer Squadron 31.

*Crommelin* was decommissioned ahead of schedule at a ceremony in Pearl Harbor, October 26, 2012.\* [3]

## 2.28.2 Ship's crest

The colors blue and gold are traditionally associated with the U.S. Navy. The three interlaced chevronels represent the Crommelin brothers after whom the ship is named. The two winged chevronels refer to the air exploits of Lieutenant Commander Richard and Commander Charles Crommelin who served and died as Naval aviators. The central chevronel over which an anchor is placed alludes to the surface ship career of Vice Admiral Henry Crommelin, the oldest and first to serve of the brothers.

The linked chevronels suggest the strength and determination of U.S. naval forces in their efforts to regain enemy held territories of the Pacific Ocean throughout World War II. It was in this effort that the Crommelin brothers so distinguished themselves.

The rampant sea lion is a symbolic creature associated with valor at sea; its head and mane are scarlet for courage and its body is gold for zeal and achievement. The scarlet sword recalls the fierce conflict of the Pacific war. The wings and silver collar with blue cross signify some of the decorations the brothers received, such as the Navy Cross, the Silver Star and the Distinguished Flying Cross.

## 2.28.3 References

- [1] Dunham, Daniel N. (16 December 2013). "USS Crommelin (FFG 37)". Navsource Online. Retrieved 23 December 2015.
- [2] USS Crommelin (FFG-37)

[3] “U.S.S. Crommelin decommissioned | More Local News - KITV Home”. Kitv.com. 2012-10-26. Retrieved 2013-07-07.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here.*

## 2.28.4 External links

- Official website
- Photo gallery of USS *Crommelin* (FFG-37) at NavSource Naval History
- united-states-navy.com: USS *Crommelin*
- USS Crommelin Alumni Association
- MaritimeQuest USS Crommelin FFG-37 pages

## 2.29 USS Curts (FFG-38)

**USS Curts (FFG-38)** was the twenty-ninth ship of the *Oliver Hazard Perry*-class of guided-missile frigates. She was named for Admiral Maurice Curts (1898–1976). *Curts* is the first ship of that name in the US Navy.

Ordered from Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 27 April 1979 as part of the FY79 program, *Curts* was laid down on 1 July 1981, launched on 6 March 1982, and commissioned on 8 October 1983. She was decommissioned on 25 January 2013.

### 2.29.1 Service history

#### 1980s

*Curts*'s early years in commission were focused on anti-submarine warfare (ASW) operations and *Curts* was the first Pacific Fleet unit with the complete SQQ-89 ASW suite. The ship received the meritorious unit commendation for tactical proficiency in the tracking of Soviet submarines in 1987.

In 1988, *Curts* received the armed forces expeditionary medal for serving with the **USS Missouri** battle group during Operation Earnest Will in the north Arabian Sea and the Gulf of Oman. Additionally, *Curts* changed homeport to Yokosuka, Japan, becoming one of the first two guided-missile frigates to join the Forward Deployed Naval Force (FDNF). *Curts* was first to bring the LAMPS MK III helicopters to Naval Air Facility Atsugi.

#### Operation Desert Storm

On 24 January 1991, during Operation Desert Storm, the ship and her embarked navy and army helicopters

captured an Iraqi garrison on Qaruh Island in the northern Persian Gulf, taking the island and custody of 51 Iraqi prisoners. *Curts* destroyed two mines, sank an Iraqi minelayer and provided support to combat helicopter operations during the battle of Bubiyan Island. The ship received the navy unit commendation for her exceptional operational performance.

#### 1990s

Upon return from combat operations in June 1991, the ship became an important part of Operation Fiery Vigil rescuing numerous refugees to safety when Mount Pinatubo erupted near Subic Bay, Republic of The Philippines.

In 1993, *Curts* was upgraded with the 4100-ton class modification, extending her stern another 8 feet (2.4 m) and enhancing her combat capabilities. *Curts* joined the *Independence* Battle Group in 1993 to participate with the Japanese Maritime Self-Defense Force in joint anti-submarine warfare exercise MAREX. Later that year, the ship deployed to the Persian Gulf conducting 89 boardings of merchant vessels in the Red Sea as part of United Nations sanctions enforcement against Iraq. *Curts* material and operational readiness was rewarded with the battle efficiency award for 1994.

In 1995, *Curts* participated in major joint exercises with units of the U.S. Navy and Japanese Maritime Self-Defense Force (JMSDF), and later with the navies of Singapore, Malaysia, and Thailand for 1996 cooperation afloat for readiness and training (CARAT 96).

In 1997, after nine years of forward presence as part of seventh fleet, *Curts* departed Yokosuka, Japan for a home-port change to San Diego, California and in October 1998 *Curts* joined the Naval Reserve Force (NRF).

In 1998, *Curts* deployed to the multi-lateral exercise Teamwork South, where she participated in exercises with navies from the United Kingdom, Colombia, Ecuador, Peru and Chile. Upon completion of Teamwork South, *Curts* steamed to Hawaii to participate in multi-lateral exercise RIMPAC 98. *Curts* made national headlines when a Salinas, Ecuador hotel security guard died from injuries he received during a scuffle with a LTJG (pilot) and Senior Chief Petty Officer assigned to HSL-43 embarked on *Curts* for the deployment. Both men were removed from the ship and returned to the U.S. to face a court martial.

In 1999, *Curts* deployed to counter-narco-terrorism deployment under the direction of Joint Inter-agency Task Force East (now named Joint Interagency Task Force South). In addition to seizing approximately 5 metric tons of cocaine, *Curts* conducted rare bi-lateral counter-narcotics exercises with the Colombian Navy. After departing a short visit to Aruba *Curts* responded to a distress call from M/V *Olga*, north of the Guajira Peninsula. *Curts*

crew were awarded the Humanitarian Service Medal for joint rescue efforts that saved the lives of several *Olga* crew members. The half-way point of this deployment found *Curts* celebrating Halloween in Key West, Christmas in St. Thomas and New Years again in Key West, Florida. The timing of this deployment also caused *Curts* to be the last U.S. warship to transit the Panama Canal under U.S. control in 1999 (ex-USS *New Jersey* was towed through just before *Curts* transit) and the first to transit it under Panamanian control in 2000.

## 2000s

During CARAT cruises in 2001 and 2003, *Curts* conducted multilateral exercises with the navies of Singapore, Thailand, Brunei, and the Philippines to continue promoting international training and cooperation.

In 2004 *Curts* again deployed to southern command on a six-month counter-narcotics deployment with Coast Guard Law Enforcement Detachment (LEDET) 105 and received national notoriety for the largest maritime seizure of cocaine (12 tons) in history.\* [2] The ship received the U.S. Coast Guard Meritorious Unit Commendation for her outstanding performance during deployment.

*Curts* deployed again in 2006 to counter-narco-terrorism deployment. Although less successful than the 2004 deployment, *Curts* interdicted three cocaine shipments, totalling in excess of 10 metric tons of cocaine and apprehension and transport of over 50 smugglers.

On 16 February 2007, *Curts* was awarded the 2006 Battle "E" award.\* [3]

In 2007 *Curts* was transferred from Commander Destroyer Squadron One, to Commander Destroyer Squadron Nine and incorporated into Carrier Strike Group Nine. In March USS *Abraham Lincoln* Strike Group (CSG-9) departed for deployment to the 5th Fleet area of operations (Persian Gulf). This marked *Curts* first Strike Group deployment since transfer to the U.S. Naval Reserve. *Curts* primarily performed a Critical Infrastructure Protection role by acting as Scene of Action Commander for Oil Platform protection efforts at the Khawar al Amaya and al Basrah oil terminals in the northern Persian Gulf. *Curts* also conducted bi-lateral exercises with the Malaysian and Pakistani navies during her transit to the Gulf.

*Curts* was decommissioned on 25 January 2013, and was transferred to the inactive reserves on 27 February.\* [4]\* [5]

In December 2012 during the 112th Session Of Congress, a transfer-by-grant was proposed. The recipient would be The Navy of Mexico, who may receive *Curts*, along with *McClusky*. Both vessels are yet to be transferred. The act of approving the transfer of vessels by the United States does not guarantee that the vessels will actually be

transferred.\* [1]

## 2.29.2 References

- [1] Cavas, Christopher P. (6 January 2013). "Congressional Chaos Costs U.S. Navy Millions, Leaves Ships in Limbo". *DefenseNews*. Retrieved 29 May 2015.
- [2] "USCG Daily Chronology: 17 September". US Coast Guard.
- [3] "Surface Force Ships, Crews Earn Battle "E"". US Navy. 19 February 2007. Retrieved 29 May 2015.
- [4] Klimas, Jacqueline (14 March 2012). "11 ships to be decommissioned in fiscal 2013". *NavyTimes*. Retrieved 29 May 2015.
- [5] Behnke, Jason (29 January 2013). "USS Curts Decommissioned After 29 Years of Service". Military.com. Retrieved 29 May 2015.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here.* Text of the Naval Vessels Transfer Act of 2012

## 2.29.3 External links

- Photo gallery of USS *Curts* (FFG-38) at NavSource Naval History
- Official page
- MaritimeQuest USS *Curts* FFG-38 pages
- GlobalSecurity.org FFG-38
- Southern Swing 1997 Cruise Book (Courtesy of Matt Christisen)
- USS *Curts* Commissioning Booklet (Contributed by DeWayne Gibson)

## 2.30 USS Doyle (FFG-39)

For other ships of the same name, see *USS Doyle*.

**USS Doyle (FFG-39)** was the 30th ship to be constructed in the *Oliver Hazard Perry* class of guided missile frigates of the United States Navy. *Doyle* was named after Vice Admiral James Henry Doyle (1897–1982). Vice Admiral Doyle was most known for his contributions during the Korean War as Commander Amphibious Group One. The ship was in service from 21 May 1983 to 29 July 2011. During her 28 years of service, *Doyle* went on at least six deployments to the Mediterranean Sea and two deployments to the Persian Gulf, including participation in Operation Earnest Will. The ship also operated in the

Black Sea, Baltic Sea, and deployed to operate with the Middle East Force. *Doyle* took part in UNITAS 39-98. Deployed to the Standing Naval Forces Atlantic, and conducted three Southern Command Deployments.\*[1]

### 2.30.1 History

Her keel was laid down by Bath Iron Works Corporation of Bath, Maine, on 23 October 1981. She was launched on 22 May 1982, sponsored by Mrs. Kathleen Doyle Watson and Ms. Anne Doyle, grand-daughters of VADM Doyle. *Doyle* was commissioned on 21 May 1983.\*[1]\*[2]

*Doyle* deployed with the *Nimitz* Battle Group for Med 1-87 to the Sixth Fleet in the Mediterranean from 30 December 1986–30 June 1987. From 24 February to 3 March 1987, *Doyle* sailed in company with guided missile cruiser *Josephus Daniels* (CG-27) through the Turkish Straits and carried out freedom of navigation exercises in the Black Sea. On 1 March 1987, a Bulgarian (Druzki-class frigate (FF.12) trailed the U.S. ships, and the Soviets closely monitored their operations in the Black Sea. *Doyle* conducted surveillance of Soviet ships and submarines at an anchorage at Astypalaia, Greece from 3 to 12 March 1987.\*[2] There were more significant incidents in adjacent years, 1986 Black Sea incident and 1988 Black Sea bumping incident.

During a counter narcotics deployment to the Caribbean, 4 April–20 June 2005, *Doyle*, and *Cutlass 463*, her embarked Sikorsky SH-60B Seahawk of Helicopter Anti-submarine Squadron (Light) (HSL) 46 Detachment 3, pursued fishing vessel *Dos Continentes*, suspected of smuggling cocaine, north of the Panamanian/Colombian coast, 3 May. The smugglers set their boat ablaze and jumped overboard. *Doyle* launched *Cutlass 463* and made for the scene at flank speed. She lowered a rigid hull inflatable boat (RHIB) that rescued four of the smugglers, and battled the fire for several hours until they extinguished the flames during the mid watch. The ship's damage control sailors, reinforced by Coast Guard law enforcement agents, boarded *Dos Continentes* and recovered several packages containing 150 pounds of cocaine from the hulk. *Doyle* prevented an estimated 13 tons of cocaine from entering the United States during this interception, and the U.S. later sank the vessel to prevent her from becoming a hazard to navigation. The frigate made a total of five interdictions during her deployment that led to the apprehension of 28 narco-terrorists, and the seizure or destruction of an estimated \$315 million worth of cocaine (83 bales during the first month alone).\*[2]

On 6 October 2005, *Doyle* returned from a six month deployment.\*[3]

On 6 December 2010, *Doyle*, her embarked SH-60B Seahawk from HSL-42, *Proud Warrior 423*, and her embarked Coast Guard Law Enforcement detachment, intercepted smuggling vessel *Rio Tuira* and seized 22 bales of

cocaine, weighing approximately 500 kilograms (1,100 lb) and with an estimated street value of \$15.4 million, in the Eastern Pacific about 180 miles from Panama.\*[2]

On 5 April 2011, *Doyle* returned from her final deployment, a six month deployment to the United States Southern Command.\*[4]

### 2.30.2 Fate

*Doyle* was decommissioned at Naval Station Mayport on 29 July 2011 after completing 27 years of service.\*[1]

On 15 December 2014 DLA Disposition Services awarded a sales contract to ESCO Marine of Brownsville, TX for the towing and dismantling of ex-*Doyle*. As of August 2015, the ship remained in Philadelphia.\*[5]

### 2.30.3 Awards

- Coast Guard Meritorious Unit Commendation, for service from 01-Nov-1985 to 28-Feb-1986\*[6]
- Coast Guard SOS Ribbon, for service from 01-Jul-1987 to 30-Sep-1987\*[6]
- Armed Forces Expeditionary Medal, for service from 11-Sep-1988 to 11-Jan-1989, Persian Gulf (24 Jul 87 – 1 Aug 90)\*[6]
- Coast Guard SOS Ribbon, for service from 01-Oct-1989 to 31-Dec-1989\*[6]
- Armed Forces Service Medal, for service from 17-Jun-1994 to 30-Jun-1994, 7-Jul-1994 to 17-Jul-1994 and 24-Jul-1994 to 8-Aug-1994, Bosnia\*[6]
- Meritorious Unit Commendation, as a part of the George Washington battle group, for service from 11-Jun-1994 to 05-Nov-1994\*[6]
- Meritorious Unit Commendation, as part of the Carl Vinson task group, for service from 10-Jul-1996 to 04-Sep-1996\*[6]
- Joint Meritorious Unit Award, for service from 01-Jan-1997 to 31-Dec-1997\*[6]
- Coast Guard Meritorious Unit Commendation, for service from 01-Apr-2005 to 30-Jun-2005\*[6]
- Coast Guard SOS Ribbon, for service from 12-Jul-2005 to 16-Sep-2005\*[6]
- Coast Guard SOS Ribbon, for service from 01-Oct-2010 to 30-Apr-2011\*[6]
- Navy E Ribbon for 1994, 1996, 1998, 2000, 2007\*[6]

## 2.30.4 Coat of Arms

The ship's motto was displayed on an azure doubled scroll with the inscription "Valiant Mariner" in gold letters.\*[7]

The shield contained an Azure lion rampant with fishtail and grasping a trident point up argent. Dark blue and gold are colors traditionally used by the Navy and represent the sea and excellence. The creature, half lion and half fish, with Neptune's trident symbolized Admiral Doyle's military prowess and accomplishments in amphibious operations.\*[7]

The crest contained the following: Upon a wreath of the colors a chevron reverse coupled or interlaced with mullet points balled argent, charged with a pentagram parted and colored in the manner of the Korean Taeguk (scarlet above, azure below) and charged with a gold mullet all encircled by a wreath of laurel vert. The stars, laurel wreath and "VEE" refer to some of Admiral Doyle's decorations and awards: The Distinguished Service Medal, Silver Star, Bronze Star Medal and the Legion of Merit. The reference to the Korean Taeguk commemorates Admiral Doyle's masterful exploits during the Korean War especially the invasion and the Hungnam withdrawal.\*[7]

## 2.30.5 References

- [1] "Doyle - Naval Vessel Historical Evaluation" (PDF). NAVSEA, US Navy. 10 November 2011.
- [2] "Doyle II (FFG-39)". Naval History and Heritage Command. 7 July 2015. Retrieved 29 December 2015.
- [3] "Doyle Returns from SOUTHCOM Deployment". US Navy News. 6 October 2005.
- [4] "USS Doyle Returns From Final Deployment". US Navy News. 5 April 2011.
- [5] "Inactive ship inventory" (PDF). NAVSEA, US Navy. 18 August 2015.
- [6] "Unit Awards website". US Navy. Retrieved 7 November 2015.
- [7] "Coat of Arms". *USS Doyle*. 15 November 2000. Archived from the original on 15 November 2000.

- This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).
- This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).
- This article incorporates public domain material from websites or documents of the United States Navy.

## 2.30.6 External links

- "official USS Doyle website". US Navy. Archived from the original on 11 December 2007.
- "USS Doyle FFG-39 pages". *MaritimeQuest*.
- "USS Doyle". *NavySite.de.*, with photos of the ship in Philadelphia, 16 October 2015.
- Photo gallery of *USS Doyle* (FFG-39) at *NavSource Naval History*

## 2.31 USS Halyburton (FFG-40)

**USS Halyburton (FFG-40)**, an *Oliver Hazard Perry*-class frigate, is a ship of the United States Navy named for Pharmacist's Mate Second Class William D. Halyburton, Jr. (1924–1945). Halyburton was posthumously awarded the Medal of Honor for his heroism while serving with the 5th Marines, during the Battle of Okinawa in 1945.

### 2.31.1 Construction

*Halyburton* was laid down on 26 September 1980 by the Todd Pacific Shipyards Co., Seattle Division, Seattle, Washington; launched on 13 October 1981, sponsored by Mrs. William David Halyburton, Sr., mother of PhM2 Halyburton; and commissioned on 7 January 1984, Commander Robert K. Peters in command.

### 2.31.2 Operations



*Halyburton* replenishes from the battleship *USS Iowa* during Ocean Safari 85

Over its commissioned service, *Halyburton* earned numerous Battle 'E' awards for combat readiness. *Halyburton* was also one of the escorts for *USS Constitution* on 21 July 1997 as "Old Ironsides" celebrated her 200th birthday and her first unassisted sail in 116 years.

### **Maersk Alabama incident**

Main article: Maersk Alabama hijacking

On 8 April 2009, Somalia pirates captured U.S.-flagged motor vessel *Maersk Alabama* and her 22 crewmembers, 300 miles from the Somali coast. The crew recaptured their ship along with one of the pirates, but the three surviving pirates held the vessel's master, Capt. Richard Phillips, hostage on a lifeboat. *Halyburton* was part of a U.S. Navy rescue mission, along with amphibious assault ship *Boxer* (LHD-4), guided missile destroyer *Bainbridge* (DDG-96), off the Horn of Africa. A ScanEagle unmanned aircraft system provided timely intelligence during the confrontation. U.S. Navy SEALS, on board *Bainbridge*, brought the standoff to an end by simultaneously shooting and killing all three pirates in the lifeboat, then being towed by *Halyburton*, and rescued Phillips on 12 April. The fourth pirate was on board USS *Bainbridge* at the time of the shooting, negotiating the hostage's release, and was taken into custody.\*[1]\*[2]

### **Constable's Dues ritual**

On 16 July 2009, *Halyburton* visited the Port of London, mooring in South Dock, West India Quay for three nights. On Saturday 18 July, she became the first non-British ship to take part in the Tower of London's Constable's Dues ritual. Dating back to the 14th century, the ceremony involved the crew being challenged for entry into the British capital, mirroring an ancient custom in which a ship had to unload some of its cargo for the sovereign to enter the city. Commander Michael P Huck and Ship's Officer, Lieutenant Commander Tony Mortimer led the crew to the Tower's West Gate, where after being challenged for entry by the Yeoman Gaoler armed with his axe, they were marched to Tower Green accompanied by Beefeaters, where they delivered a keg of Castillo Silver Rum, representing the dues, to the Tower's Constable, Sir Roger Wheeler.\*[3]

### **2014**

*Halyburton* departed her homeport of Naval Station Mayport in January 2014, for her final deployment. She was scheduled to be decommissioned in late 2014.\*[4]

On 6 February 2014, a Panamanian helicopter crashed while working with *Halyburton* on illicit trafficking operations. The Bell 412 helicopter had nine people aboard, one of whom died in the crash.\*[5]

*Halyburton* was ceremonially decommissioned on 6 September 2014 at Naval Station Mayport.\*[6]\*[7] *Halyburton* was formally decommissioned and struck from the Naval Vessel Register, 8 September 2014. Ex-*Halyburton* was listed as being berthed at the Naval Inactive Ship Maintenance Facility, Philadelphia, Pennsyl-

vania.<ref name= NVR"> "Halyburton" . *Naval Vessel Register*. Retrieved 16 September 2014.</ref> She may be transferred to the Turkish Navy in 2015.\*[8] In 2013, a bill to transfer *Halyburton* to Turkey in 2015 passed the US House of Representatives. However, the Senate did not take action on the bill and it did not become law.\*[9]\*[10]

### **2.31.3 References**

- [1] "American captain rescued, pirates killed, U.S. official says" . CNN. 12 April 2009. Retrieved 12 April 2009.
- [2] Evans, Mark L. (14 July 2015). "Halyburton (FFG-40)". Naval History and Heritage Command. Retrieved 30 December 2015.
- [3] "US ship in ancient Tower ceremony" . BBC News. 18 July 2009. Retrieved 18 July 2009.
- [4] "USS Halyburton Deploys" . Retrieved 9 April 2014.
- [5] Day, LT Mark (6 February 2014). "USS Halyburton Assists in Rescue of Panamanian Crashed Helicopter" . Retrieved 9 April 2014.
- [6] Santarelli, LTJG Stephanie (8 September 2014). "Halyburton is Decommissioned" . US Navy News Service. Retrieved 10 September 2014.
- [7] "Frigate Halyburton decommissioned after 30 years of service" . Navy Times. 9 September 2014. Retrieved 10 September 2014.
- [8] "Farewell, Halyburton,American's First Combat Drone Carrier" . War is Boring,. Retrieved 12 September 2014.
- [9] "H.R. 6649 (112th): Naval Vessels Transfer Act of 2012" . Retrieved 10 April 2014.
- [10] "Congress rejects surplus U.S. frigates for Turkey" . World Tribune. 15 April 2013.

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### **2.31.4 External links**

- USS *Halyburton* official website
- Photo gallery of USS *Halyburton* (FFG-40) at NavSource Naval History
- navysite.de: USS *Halyburton*
- MaritimeQuest USS *Halyburton* FFG-40 pages
- USS *Halyburton* command histories at the Naval History & Heritage Command

## 2.32 USS McClusky (FFG-41)

**USS McClusky (FFG-41)**, an *Oliver Hazard Perry*-class frigate, is a ship of the United States Navy named for Rear Admiral C. Wade McClusky (1902–1976). In the Battle of Midway, then-Lieutenant Commander McClusky led USS *Enterprise*'s air group, which sank the Japanese carriers *Kaga* and *Akagi*. She was last a part of Destroyer Squadron 1. After 31 years of service, *McClusky* was decommissioned on 14 January 2015 at Naval Base San Diego.

### 2.32.1 Construction

*McClusky* was laid down on 21 October 1981 by the Todd Pacific Shipyards, Los Angeles Division, San Pedro, California; launched on 18 September 1982; sponsored by Mrs. Ruth Mundy McClusky; and commissioned on 10 December 1983 in Long Beach, California, Commander Robert Burgess Lynch in command.

### 2.32.2 Service

In 1986 *McClusky* was part of Destroyer Squadron 23 under Captain Todd Barthold.\* [1] *McClusky* embarked on her first deployment on 15 January 1986. She was a part of Battle Group Foxtrot, headed by USS *Enterprise* (CVN-65) and including *Truxtun*, *Arkansas*, *O'Brien*, *Reasoner*, *Lewis B. Puller*, and *David R. Ray*. The battle group sailed directly for the Indian Ocean, with stops in Hawaii, Naval Station Subic Bay, and Singapore.

In 1988 *McClusky* began the year as part of Joint Task Force Middle East carrying out Operation Earnest Will missions. She participated in Exercise RIMPAC that year as part of the Orange Force.

In 1990 *McClusky* was part of Destroyer Squadron 13. She began the year at Mina Sulman, Bahrain, on a Middle East Force deployment. On 3 January, she was underway for a Northern Persian Gulf patrol, which included a refueling stop at anchorage in Kuwait on 10 January. Upon returning to Mina Sulman on 13 January for the final time, the mastmounted sight was removed. After a short patrol of Northern Persian Gulf, *McClusky* headed south towards the Straits of Hormuz, completing a successful three month assignment to the Middle East Force. On 30 January, *McClusky* anchored alongside *Rodney M. Davisin Fujayrah* for a Middle East Force turnover before meeting up with the *Gary* and transiting to the Western Pacific. A refueling visit to Colombo, Sri Lanka on 1 February proved to be an excellent stop, providing all hands the opportunity to purchase many souvenirs.

From 31 August to 4 September 1990, *McClusky* had the privilege of hosting the Soviet oiler *Argun*, visiting San Diego with two Soviet combatants. The arrival of the *Admiral Vinogradov*, Sovremenny class de-

stroyer *Boyevoy*, and *Argun* in San Diego on 31 July 1990 was followed by a ceremony with Admiral Charles R. Larson (Commander-in-Chief, Pacific Fleet) Mayor O'Connor, and Admiral Khvatov (ru:Хватов, Геннадий Александрович), the Commander of the Soviet Pacific Fleet, as speakers.

In 1991 *McClusky* shifted homeports to Yokosuka, Japan and joined Destroyer Squadron 15. She assisted in Operation Fiery Vigil, the evacuation of civilians from the Philippines during the eruption of Mount Pinatubo.

### 2.32.3 Future

*McClusky* will be sold to the Mexican Navy under the FMS.\*[2]

### 2.32.4 Important Events

- 1983 – 10 December, Lieutenant Donald R. Calloway becomes the ship's first Supply Officer.
- 1986 —Involved in the patrolling of Taiwan International Waters during large scale Chinese People's Liberation Army Navy exercises in the region.
- 1986 - Jan - July First Pacific Deployment.
- 1987 - 1988 Persian Gulf deployment, Operation Earnest Will.
- 1988 - Pacific Rim Exercise.
- 1989 - 1990 Persian Gulf deployment.
- 1992 —The ship visited Vladivostok in the Russian Federation, the first ship to do so after the breakup of the Soviet Union.
- 1996 —After three Persian Gulf Deployments, 15 bilateral exercises and over 40 port visits, *McClusky* departs Yokosuka for homeport shift back to San Diego.
- 2000 —First Counter Narcotics Operations —numerous busts and drug seizures
- 2002 —Counter Drug Operations, and Rescue of Richard Van Pham, Shift ISIC from Destroyer Squadron 7 (DesRon 7) to Destroyer Squadron 1.
- 2003 —INSURV and Battle “E” Winner —Counter Drug OPS
- 2011 —Battle “E” Winner(6th award) and NAVSTA San Diego Energy Efficiency Award (FFG Class) winner, commanded by Commander Darren Glaser.

- Dec 2012 — As of 2012, *McClusky* was commanded by Commander Murz Morris, and in the later half of the year deployed with Carrier Strike Group One. During the 112th session of Congress, a proposal was made to grant the transfers of the USS *McClusky* and the USS *Curts* to the Mexican Navy.\*[3]
- *McClusky* ended a three-month restricted-availability period in January 2013.\*[4]
- 2013 – Scored above class average during INSURV and 2013 Battle “E” Winner, commanded by Commander Murz Morris.
- 2014 – 10 April The Final Deployment/Voyage of the USS McClusky
- 2015 – 14 January, Decommissioned in San Diego, CA

### 2.32.5 References

- [1] McClusky Command History 1986
- [2] <http://seapowermagazine.org/stories/20140703-ship-retirements.html>
- [3] “Text of H.R. 6649 (112th): Naval Vessels Transfer Act of 2012 (Received by the Senate version)”. GovTrack.us. Retrieved 2013-11-08.
- [4] “2013 History”. *USS McClusky FFG-41*. USCarrier.net. 15 March 2013. Retrieved 2013-03-15.

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### 2.32.6 External links

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- *USS McClusky* official website
- Photo gallery of *USS McClusky* (FFG-41) at NavSource Naval History
- Naval Vessel Register entry for *McClusky*
- united-states-navy.com: *USS McClusky*
- MaritimeQuest *USS McClusky* FFG-41 pages
- • *USS McClusky* (FFG-41) command histories – Naval History & Heritage Command
  - 1986
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## 2.33 USS Klakring (FFG-42)

**USS Klakring (FFG-42)**, an *Oliver Hazard Perry*-class frigate, was a ship of the United States Navy named for Rear Admiral Thomas B. Klakring (1904–1975), who was awarded three Navy Crosses as commander of the submarine *USS Guardfish* during World War II.

### 2.33.1 Construction and Commissioning

*Klakring* was laid down on 19 February 1982 by the Bath Iron Works Corp. Bath, Maine; launched on 18 September 1982; sponsored by Beverly Bohem, niece of Rear Admiral Klakring; and commissioned on 20 August 1983 at Bath, Commander Leonard O. Wahlig in command.\*[1]

### 2.33.2 Service History

#### 1980s

**1983** *Klakring* completed a Light-Off Examination on 8 September 1983, followed on 15 September by her Initial Crew Certification. The ship reached her initial home port of **Charleston, South Carolina**, on 18 September. Family members and friends on the pier displayed home-made banners while they welcomed the ship as she maneuvered up the **Cooper River** on 28 September.\*[1]

The ship sailed for her shakedown cruise to Caribbean waters. She visited **St. Thomas, Virgin Islands** (4–7 November 1983), and on 13 November put into **Guantánamo Bay, Cuba**. *Klakring* sailed on 3 December, carried out a Weapons Systems Accuracy Test at **Port Everglades, Florida**, and then test fired torpedoes on the range at **Atlantic Undersea Test and Evaluation Center (AUTEC), St. Andros Island**, on 13 December. She returned to **Charleston** on 16 December.\*[1]



A close-in starboard bow view of *Klakring* as she steams in the Atlantic, 28 June 1983. (U.S. Navy photograph DN-SC-86-05678, courtesy of Bath Iron Works, Defense Visual Information Center)

**1984** *Klakring* carried out additional training during the New Year 1984, including a visit to **Nassau, Bahamas** (27–30 January 1984), a brief stop for fuel in **Frederiksted, St. Croix, Virgin Islands**, and another port visit on 18 February to **Naval Station Roosevelt Roads, Puerto Rico**. *Klakring* completed her Post Shakedown Availability at Bath (5 April–23 August). The yard work included the installation of fin stabilizers. The ship conducted her sea trials on 29 September, and on loaded weapons from **Norfolk, Virginia**, on 7 September. Hurricane **Diana** swept up the East Coast and delayed the

frigate's return to **Charleston** from her scheduled date of 11 September to 16 September. The ship completed a variety of training during the succeeding weeks, and escorted the aircraft carrier ***Nimitz*** during mid November.\*[1]

**1985** *Klakring* sailed for nearly five weeks of Refresher Training off **Guantánamo Bay** on 14 January 1985. On 21 February, Helicopter Antisubmarine Squadron (Light—HSL-42) Detachment 3, equipped with a single Sikorsky SH-60B Seahawk Light Airborne Multi-Purpose System (LAMPS) Mk III, embarked on board *Klakring*. The ship began participation in her first major fleet exercise, Composite Unit Training Exercise (COMTUEX) 2-85, on 22 April 1985. She broke up the training with a three-day visit to **Frederiksted, U.S. Virgin Islands**, and returned to **Charleston** on 8 May.\*[1]

The destroyer ***Comte de Grasse*** and *Klakring* sailed as MEF 3-85 Transit Group for the Middle East Force on 7 June 1985. This cruise marked the frigate's first overseas deployment. Comdr. Whalig served as the group's Officer in Tactical Command (OTC). The two ships fueled and provisioned at **Ponta Delgada, Azores** on 13 June, entered the **United States Sixth Fleet**, and stopped for additional fuel and supplies at **Rota, Spain** on 16 June. *Klakring* visited **Palma de Mallorca, Spain** (18–21 June). The ship then crossed the **Mediterranean** by easterly courses.\*[1]

*Klakring* passed southbound through the **Suez Canal** on 25 and 26 June 1985. As the ship crossed the **Red Sea**, she began to observe the weekends on Thursdays and Fridays to assimilate crewmen to Muslim daily routines. *Klakring* fueled and provisioned at **Djibouti, Horn of Africa**, on 30 June. On 1 July, she rendezvoused with guided missile destroyer ***Charles F. Adams*** and exchanged information and equipment. Whalig became Commander Task Unit (CTU) 109.1.2, and oversaw the scheduling of all multi-ship training in the **Persian Gulf**. *Klakring* sailed through the **Strait of Hormuz**, and on 7 July rendezvoused with command ship ***La Salle*** near **Abu Dhabi, United Arab Emirates (UAE)**. The frigate escorted the flagship to **Sitrah, Bahrain**.\*[1]

During the ship's first two months in the Persian Gulf, visibility averaged barely 2 mi (3.2 km) because of haze, sand, and dust. The daily temperature repeatedly rose to 117 °F (47 °C) with 90% humidity. The frigate's Seahawk flew an average of two sorties per day, and the crew reported that the presence of the strong temperature inversion made radar ranges of 160 nautical miles at altitudes below 500 ft (150 m) common, which extended the helo's patrol coverage of the region.\*[1]

The ship next visited **Al Jubayl, Saudi Arabia** (14–17 July 1985), briefly patrolled the Persian Gulf, and then completed upkeep at **Mina Salman, Bahrain** (22–31 July). On 6 August, *Klakring* escorted ***La Salle***, and fueled and provisioned at **Sitrah** on 20 August. The frigate

sailed from the Persian Gulf, and (25–28 August) visited Karachi, Pakistan. She passed through the Strait of Hormuz into the Persian Gulf on 31 August, and completed an additional upkeep at Dubai, UAE (3–10 September). The ship anchored at Sitrah for a Combat Systems Groom (13–15 September). On 20 September, she sailed from the Persian Gulf and trained with the Indian Ocean Battle Group, focusing on aircraft carrier operations, anti-air warfare, underway replenishment, and antisubmarine warfare. *Klakring* returned to the Persian Gulf on 24 September, training along the way with French aviso *Quartier-Maître Anquetil*.<sup>\*[1]</sup>

After topping off her fuel and provisions on 26 October 1985, *Klakring* made for Ash Shuaibah, Kuwait, as the flagship for Commander Middle East Force. The ship patrolled the Persian Gulf, and completed upkeep at Mina Salman (30 October–4 November). The guided missile frigate *Gallery* relieved *Klakring* in the Persian Gulf on 6 and 7 November. On 9 November, *Klakring* rendezvoused with *Comte de Grasse* and the two ships formed a transit group back to the United States. Comdr. Wahlig again served as OTC for the group.<sup>\*[1]</sup>

*Klakring* fueled and provisioned at Djibouti on 11 November 1985, and continued northward across the Red Sea, returning to the standard workweek when she reached the southern entrance to the Suez Canal on 15 November. The following day, both ships transited the canal northbound, and visited Malaga, Spain (20–23 November). On 24 November, *Klakring* fueled and provisioned at Rota on 24 November, and that same afternoon entered the Second Fleet. The frigate celebrated Thanksgiving in Ponta Delgada, and returned to Charleston on 6 December 1985. On 12 December, Comdr. James M. Coon relieved Comdr. Wahlig as the commanding officer.<sup>\*[1]</sup>

**1986** The ship accomplished Combined At Sea Operations (CASTOPS) 2-86 (3–15 February 1986), including a visit to Nassau in the Bahamas (8–11 February). *Klakring* underwent an Operational Propulsion Plant Examination (OPPE) from 26 to 28 April, 1 and 2 May, and 29 and 30 May. The ship visited Savannah, Georgia, on 27 and 28 June. *Klakring* trained with *Nimitz* from 8 to 17 July 1986, including a visit to Port Everglades (11–14 July). On 31 July and 1 August, the ship conducted special projects for the Chief of Naval Operations (CNO).<sup>\*[1]</sup>

Following her CNO project and a visit to Dodge Island Terminal, Miami, Florida (8–10 September) *Klakring* held a Tiger Cruise for her crew's dependents, on 11 September 1986. While the ship sailed to the operating area, she received a distress call from *King Fisher II*, a small fishing boat from Charleston. *Klakring* proceeded at full speed to *King Fisher II*, and the ship transferred her emergency party via small boat to render assistance. The frigate returned to port on 12 September. On

29 September she off loaded her weapons at the Naval Weapons Station Charleston, and completed her first Selective Restricted Availability (SRA-1) from 30 September to 5 December. On 12 December, *Klakring* on loaded her weapons from the Naval Weapons Station, and carried out her sea trials (15–18 December).<sup>\*[1]</sup>

### 1987 Main articles: Iran-Iraq War and Operation Earnest Will

*Klakring* completed a number of training exercises during the New Year, including Fleet Exercise (FLEETEX) 1-87 and a War at Sea scenario (10–27 February 1987), and Solid Shield 87, FLEETEX 2-87, and another War at Sea scenario from 30 April to 10 May. *Klakring* deployed from Charleston for the Middle East on 6 June 1987. On 8 June she rendezvoused with the other ships of her transit group, and refueled at Rota on 15 June. The frigate visited Taormina, Sicily (19–21 June). She passed through the Suez Canal into the Red Sea on 24 June, and on 29 June refueled at Djibouti.<sup>\*[1]</sup>

The ship supported Operation Earnest Will. The Iranians and Iraqis escalated their attacks against ships sailing in the Persian Gulf during the Persian Gulf War between those two countries, and the U.S. launched Earnest Will to maintain freedom of navigation in the area. The Americans initially renamed and reflagged eleven Kuwaiti tankers. *Klakring* patrolled the Persian Gulf between Radar Picket Stations North and South. The ship repeatedly passed outbound through the Strait of Hormuz to refuel from underway replenishment ships, and then returned to the Persian Gulf. On 10 August, *Klakring* embarked a detachment of Army helicopters and helped coordinate the efforts of British tugs converted for mine sweeping. *Klakring* escorted *Bridgeton*—reflagged tanker *Al Rekkah*—outbound through the Strait of Hormuz on 30 August. The Iranians mined *Bridgeton* on 24 July, but the tanker survived.<sup>\*[1]</sup>

The frigate rendezvoused with cargo ship *Courier* and steamship *President Pierce* and escorted them to Fujairah (2 and 3 September 1987). On 3 September, she escorted tanker *Sealift Mediterranean* to Bahrain. *Klakring* escorted tanker *Sealift Pacific* through the Strait of Hormuz on 1 October. *Klakring* passed outbound through the Strait of Hormuz and anchored at Fujairah on 24 October. The guided missile frigate *Carr* relieved *Klakring* on 26 October. The frigate refueled at Djibouti on 29 October, visited Jeddah, Saudi Arabia (1–4 November), passed northbound through the Suez Canal on 7 November, and (12–16 November) visited Saint Raphael, France. The ship put into Palma de Mallorca (17–21 November), on 22 November refueled at Rota, refueled again at Ponta Delgada on 26 November, and returned to Charleston on 4 December.<sup>\*[1]</sup>



*5 July 2002: The Eastern Pacific Ocean - A BQM-64E drone is launched from the deck of Klakring during the Pacific Phase of UNITAS 43-03. UNITAS (Latin for "unity") involves warships from six countries participating in ten days of intense war games designed to build multinational coalitions while promoting hemispheric defense and mutual cooperation. (U.S. Navy photo DVID #DN-SD-03-16941 by PHI Shane T. McCoy from the DVIC)*

**1988** Comdr. Dennis J. Van Buskirk relieved Comdr. Coon as the commanding officer on 22 January 1988. Klakring completed repairs in drydock at **Jacksonville Shipyards, Florida** (1–22 February). The ship accomplished Interim Readiness Training with Task Group (TG) 43.2 at Guantánamo Bay (21 March–13 April). A variety of training exercises followed, broken by a visit to **Ft. Lauderdale, Florida** (8–13 May). She carried out further training, refueled at Roosevelt Roads on 18 May, visited St. Thomas (18–21 May), and on 27 May returned to Charleston. *Klakring* loaded a **Coast Guard Rigid Inflatable Boat** in preparation for her Caribbean Law Enforcement Operations (CDOPs) on 13 June 1988, setting sail the following day. The ship embarked a helicopter detachment at **Mayport, Florida**, on 18 June, and the following day the remaining Coast Guardsmen and their equipment boarded at Miami. *Klakring* participated in CDOPs (22 June–8 July), and returned to Charleston on 13 July.\*[1]

The ship took part in Middle East Force Exercise (MEFEX) 1-89 with destroyer *O'Bannon* and guided missile frigates *De Wert* and *Hawes* in the Caribbean (12–28 October 1988). On 19 October, *Klakring* and *De Wert* anchored off Vieques Island, Puerto Rico, for drills with a **Navy Sea, Air, Land (SEAL) Team**. *Klakring* also conducted flight operations with Army helicopters on 27 October.\*[1]

**1989** *Klakring* began her duties as host ship for the West German frigate *Rheinland-Pfalz* on 14 March 1989.\*[1]

*Klakring* took part in FLEETEX 3-89 (13–28 April).\*[1]

*Klakring* deployed as part of MED 3-89 on 31 May 1989. The group comprised aircraft carrier *Coral Sea*, guided missile cruisers *Mississippi*, *San Jacinto*, and *Thomas S. Gates*, guided missile destroyer *John King*, guided missile frigate *Kauffman*, frigates *Ainsworth* and *Aylwin*,

amphibious assault ship *Nassau*, amphibious transport dock *Shreveport*, tank landing ship *Barnstable County*, oiler *Monongahela*, ammunition ship *Butte*, and destroyer tender *Shenandoah*.\*[1]

While *Klakring* passed through the Strait of Gibraltar at 0400 on 11 June, she launched her helo in 44 knot winds. The ship relieved *Charles F. Adams* on 14 June. In company with *San Jacinto* she passed northbound through the Dardanelles and Bosphorus on 18 June, and visited Constanta, Romania (19–22 June). Comdr. Van Buskirk and Capt. H. Ward Clark, the Commanding Officer of *San Jacinto*, were flown to Bucharest to meet with Romanian defense leaders.\*[1]

*Klakring* returned through the Bosphorus and anchored at Istanbul, Turkey, on 23 June. On 27 June, she sailed southbound through the Dardanelles, and completed an intermediate maintenance availability with Haifa Shipyard, Ltd., Haifa, Israel, from 30 June to 10 July. Following her maintenance, she took part in Noble Dina 3, a joint US-Israeli naval exercise (10–13 July). She visited Alexandria, Egypt (19–24 July), and returned to Haifa (28–31 July). Rear Adm. Richard C. Macke, Commander Carrier Group 2, boarded the ship before her departure.\*[1]

The frigate set a course for Palma, Spain, but on 1 August 1989, Arab terrorists in Beirut hanged Lt. Col. William R. Higgins, USMC, a member of the UN peacekeeping forces in Lebanon, and threatened to murder additional hostages they held. *Klakring* steamed to Alexandria, where Admiral Macke boarded *Coral Sea*, and the carrier made for the Eastern Mediterranean as a show of force. *Klakring* spent August off the Lebanese coast on contingency operations.\*[1]

*Mississippi*, *Kauffman*, and *Klakring* visited Marseille, France (4–13 September 1989). *Klakring* participated in Display Determination, a multi-national exercise involving U.S., Italian, Spanish, and Turkish forces, across the Mediterranean and Aegean Seas (13 September–2 October). During the exercise, *Klakring* received word that Hurricane Hugo devastated Charleston. The Wives Support Group and the ship's Ombudsman, Janice Moore, confirmed that none of the crewmen's dependents sustained serious injuries. The ship took part in the 39th activation of Naval On Call Forces, Mediterranean, at Ancona, Italy (9–14 October 1989), and in the seaward exercise of the commemoration, Deterrent Force 2-89 (14–19 October). *Klakring* operated with British destroyer *Coventry* and fast fleet tanker *Olmeda*, Spanish corvette *Descubierta*, Greek frigate *Elli*, Italian frigate *Euro*, Turkish destroyer *Kılıç Ali Paşa*, and West German destroyer *Schleswig-Holstein*. The exercise concluded with a briefing in Augusta Bay, Sicily. The frigate *Bowen* relieved *Klakring* at Alicante, Spain, on 27 October. Three days later, *Klakring* put to sea and on 10 November she returned to Charleston.\*[1]

## 1990s

**1990** *Klakring* began 1990 import Charleston, South Carolina after returning from a Mediterranean cruise in November.

In January, *Klakring* spent most of her time in the Charleston and Jacksonville OPAREA's conducting exercises. After completing an combat Systems Assessment on January 10, the ship arrived in Port Everglades, Florida on 13 January for an five day port visit. While transiting back to Charleston, the ship encountered extremely rough weather with high winds and heavy seas. The Commanding Officer made the decision to enter port at night due to heavy weather, and the crew successfully conducted a difficult navigation detail in the Cooper River and returned *Klakring* to homeport during the stormy night.

The last two weeks of February were spent preparing for Type Commander's Core Training (TCCT) 2-90 and conducting deck landing qualifications with **Helicopter Anti-Submarine Light FORTY SIX** in the Jacksonville OPAREA. On 22 February, the ship rendezvoused with the frigate *Truett* and submarine *San Juan* just east of the Bahamas. *Klakring* arrived in Roosevelt Roads, Puerto Rico on 26 February, onload exercise torpedoes, and was underway to the Puerto Rico OPAREA to begin TCCT 2-90.

During TCCT 2-90, the ship participated in numerous tracking and gunnery exercises, underway refuelings, highline transfers, and anti-submarine warfare evolutions. In addition, *Klakring* was selected to conduct two live missile firings along with the cruiser *Mississippi*. Only one of the two missiles engaged the target due to a missile failure on the first missile fired. The event was significant in providing critical data needed in the performance evaluation of one of the Navy's primary weapons.

The month of March consisted of an Operational Propulsion Plant Examination (OPPE) and a Change of Command Ceremony. The two day engineering inspection was completed on 23 March. On 30 March, CDR Larry J. Carter relieved CDR Dennis J. Van Buskirk as the fourth Commanding Officer of the frigate.

On 5 April, the ship began its preliminary preparations for its scheduled Dry-Docking Selective Restricted Availability (DSRA) with an offload of ammunition and weapons at the Charleston Naval Weapons Station. *Klakring*'s non-essential ammunition being transferred to the frigate *Fahrion*.

On 14 May, the ship was underway en route to Mayport Naval Station, Florida to make final preparations to enter the shipyard. All hands participated in an Integrated Logistics Overhaul offload of all shipboard parts and supplies completed on 16 May , and on 23 May, *Klakring* was dry-docked at Atlantic Dry Dock facility to begin the DSRA. The entire crew was moved into the Jacksonville Airport Days Inn Motel and would reside there for a period of 74 days.

In early August, the crew moved out of the Days Inn Motel and returned to shipboard living. On 27 August, installation of the SQR-19 Tactical Towed Array Sonar System began.

*Klakring* started the month of September preparing for the most important of a continued series of inspections: the Propulsion Examination Board Light-Off Examination (LOE). LOE commenced on 10 September and on 12 September she was "certified to steam." The end of the overhaul period was drawing near, and on 14 September the ship was underway for the final phase: the post-DSRA sea trials. All systems proved reliable and *Klakring* was delivered on 17 September, thirty-one days ahead of schedule and under budget. The ship would remain at the Mayport Naval Station for another month.

On 25 October, the ship got underway from Mayport and arrived at homeport Charleston one day later. Upon arrival, there was a Welcome Home Party held on board for all the families and friends of the crew.

*Klakring* was scheduled to participate in Caribbean Law Enforcement Operations in November, but a post overhaul hull inspection brought about a change in plans. After careful examination of videos of an underwater hull inspection, it was determined that the ship's hull would have to be repainted. *Klakring* was dry-docked from 7–21 November at the Charleston Naval Shipyard to undergo the necessary repairs. The ship successfully received full aviation certification on 27 November, and began final preparations for a Harpoon Missile Tactical Qualification.

On 5 December , the ship was underway to embark HSL-48's Lamps MK III crew to participate in Destroyer Squadron Six "Operation Greyhound" for two days, fine tuning the skills of ship maneuvering and communications. In addition, *Klakring* turned north on 7 December en route to the Boston OPAREA to conduct at sea evaluations of the Navy's new MK 50 Torpedo. Assisting aircraft were able to fire weapons, but continuously adverse weather conditions prevented *Klakring* and HSL-48 from doing so. The ship returned to Charleston on 19 December and began another extensive inspection the following day. The ship's Training Readiness Evaluation was completed on 21 December and the holiday stand down period began with a children's Christmas party held on board.

USS *Klakring* ended 1990 in port Charleston.\*[2]

## 1991

### 2000s

### 2010s

As of 2006, *Klakring* was homeported at NAVSTA Mayport, Florida, and was part of Destroyer Squadron 14. In

March 2008 and 2009, the ship was the subject of protests in Sevastopol, Ukraine when it visited the port for five-day "friendly" visits.\*[3]

*Klakring* participated in Operation Earnest Will in the Persian Gulf in 1987 as the first air-capable, air-emarked ship. The frigate participated in Operation Prime Chance in the Persian Gulf during the "Tanker War".

*Klakring* is one of the surface combatants in Larry Bond's 1993 technothriller "Cauldron".

*Klakring* was decommissioned on 22 March 2013.\*[4]

### 2.33.3 Awards

### 2.33.4 References

- [1] Frey, Courtney; Evans, Mark L. (28 July 2015). "*Klakring (FFG 42)*". Naval History and Heritage Command. Retrieved 5 January 2016.
- [2] Archived 1 February 2014 at the Wayback Machine
- [3] "US Frigate's 'Friendly Visit' Gets A Furious Reception". *The Times*. 26 March 2009.
- [4] Klimas, Jacqueline (14 March 2012). "11 ships to be decommissioned in fiscal 2013". *NavyTimes*. Retrieved 23 June 2015.
- This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).
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### 2.33.5 External links

Media related to USS Klakring (FFG-42) at Wikimedia Commons

- USS *Klakring* official website
- Photo gallery of USS *Klakring*(FFG-42) at NavSource Naval History

- navysite.de: USS *Klakring*
- MaritimeQuest USS *Klakring* FFG-42 pages
- USS *Klakring* command histories at the Naval History & Heritage Command

## 2.34 USS Thach (FFG-43)

**USS Thach** (FFG-43), an *Oliver Hazard Perry*-class frigate, was a ship of the United States Navy named for Admiral John Thach (1905–1981), a Naval Aviator during World War II, who invented the Thach Weave dogfighting tactic.

### 2.34.1 Construction and design

*Thach* was laid down on 6 March 1981 by the Todd Pacific Shipyards, Los Angeles Division, San Pedro, California; launched on 18 December 1982; sponsored by Mrs. Madalyn J. Thach, widow of the namesake; and commissioned on 17 March 1984 at Long Beach, Cmdr. Dale H. Moses in command.\*[2]\*[3]

*Thach*'s mission was to provide anti-air, anti-surface, and anti-submarine protection for carrier battle groups, naval expeditionary forces, replenishment groups, convoys, and other military and merchant shipping. The new direction for the naval service remained focused on the ability to project power from the sea in the critical littoral regions for the world.\*[4]

Success in the warfare environment of the 1990s and beyond required thorough evaluation, rapid decision-making and almost instantaneous response to any postulated threat. The systems aboard *Thach* were designed to meet these demanding and dynamic prerequisites, and to do so with minimum human interface. The Sikorsky SH-60 Seahawk's video data link system brought state-of-the-art computer technology to the warfare arena, as well as integrating sensors and weapons to provide a total offensive and defensive weapons system.\*[4]

In addition, computers controlled and monitored the gas turbine engines (the same engines installed on DC-10 aircraft) and electrical generators. Digital electronic logic circuits and remotely operated valves were monitored in Central Control Station which initiated engine start and resulted in a "ready to go" status in less than ten minutes.\*[4]

### 2.34.2 Service history

In 1986, the ship, part of Destroyer Squadron 21, deployed to the Western Pacific as part of a battleship battle group led by *New Jersey*.\*[5]

In late 2006 while deployed to the Southern Pacific, *Thach* caught fire as she attempted to put out a fire on a drug smuggling ship.

Cmdr. Steven R. Rasmussen, a 1988 graduate of the Naval Academy who took command of the ship 6 October 2006, was relieved of command on 28 February 2008 by the commander of Destroyer Squadron 7.\*[6]

### 2.34.3 Fate

*Thach* was decommissioned at Naval Base San Diego 1 November 2013, Cmdr. Hans E. Lynch in command. The ship was homeported in San Diego and was part of Destroyer Squadron 23.\*[7]

### 2.34.4 Ships Crest

Like all heraldic Navy insignias, *Thach*'s crest has special meaning. The blue and gold colors are traditionally associated with the Navy; blue for the sea and gold for excellence. The pair of wings in the upper crest refers to Admiral Thach's contributions to naval aviation as a pilot and leader. One of the contributions to naval aviation as a pilot and leader was his invention of the "Thach Weave," symbolized by the interlaced silver chevrons. This two-plane fighter tactic, used to cover each other from enemy fighters, is still used by fighter aircraft today.\*[4]

The three-pronged trident is shown pointing down from the sky, symbolizing naval aviation's role of projecting power from the sky and the sea. The three tines of the trident also represent Fight Squadron Three, the unit Admiral Thach commanded during early Pacific carrier battles in World War II. The cross within its outlined border and the wreath refer to Admiral Thach's first and second awards of the Navy Cross and the Navy Distinguished Service Medal.\*[4]

The anchor in the center of the insignia focuses attention on the nautical nature of both Admiral Thach's service to his country as well as that of our ship. The ship's motto, "Ready and Able," is representative of Admiral Thach's preparation and success in battle, as well as the challenge for today's Sailors serving on board USS *Thach*.\*[4]

### 2.34.5 Gallery

- USS *Thach* (FFG-43)
- USS *Thach* entering San Diego Bay, 2004

### 2.34.6 References

[1] "FFG-7 Class". *Federation of American Scientists*. Retrieved 12 September 2014.

[2] "Naval Vessel Historical Evaluation USS Thach" (PDF). NAVSEA. 17 December 2013.

[3] "Thach Ship History" (PDF). 1984.

[4] "USS Thach". US Navy. 2014. Retrieved 13 October 2014.

[5] "Thach (FFG 43)". 9 April 2014. Retrieved 5 January 2016.

[6] Fuentes, Gidget (29 February 2008). "Thach skipper fired for loss of confidence". *Navy Times*.

[7] Ryan, MCSC (SW/AW) Donnie W. "USS Thach Decommissioned After 29 years of service". *Commander Naval Surface Force, U.S. Pacific Fleet*.

- This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).
- This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).
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### 2.34.7 External links

- USS *Thach* official website
- Photo gallery of USS *Thach* (FFG-43) at NavSource Naval History
- navsite.de: USS *Thach*
- MaritimeQuest USS Thach FFG-43 pages
- Navy.mil March 2006 article on Bahamas goodwill mission
- USS *Thach* (FFG-43) command histories – Naval History & Heritage Command:
  - 1984 • 1985 • 1987 • 1988 • 1989 • 1990 • 1991 • 1992 • 1993 • 1994 • 1995 • 1996 • 1999 • 2000 • 2001 • 2002

## 2.35 USS De Wert (FFG-45)

USS *De Wert* (FFG-45), an *Oliver Hazard Perry*-class frigate, was a ship of the United States Navy. She was named for Hospitalman Richard De Wert (1931–1951). De Wert posthumously received the Medal of Honor for his heroism while serving with the 7th Marines during the Korean War.

*De Wert* was laid down on 14 June 1982 by the Bath Iron Works, in Bath, Maine; launched on 18 December 1982, sponsored by Rita C. Kennedy; and commissioned on 19 November 1983 at Bath, Commander Douglas Armstrong in command.<sup>\*[1]</sup>

Commander Destroyer Squadron Six conducted a Command Administration Inspection 24-26 August 1985.<sup>\*[2]</sup> The ship got underway with an air detachment embarked 13 August through 7 September to participate in a Readiness Exercise (READEX 3-85), along with fifteen surface ships, two (2) submarines of the United States Atlantic Fleet and one unit of the Royal Netherlands Navy.

The ship got underway on 2 October for its first major overseas deployment. *De Wert* joined the Sixth Fleet on 14 October and participated in Operation Display Determination 85, under the command of Commander Task Force 60 with 2 carriers, 16 warships, and 130 aircraft of the Sixth Fleet. This exercise proved to be predominately an anti-aircraft and anti-submarine warfare exercise.

On 16 February 2007, *De Wert* was awarded the 2006 Battle "E" award.<sup>\*[3]</sup>

In 2011, *De Wert* earned all command excellence awards and was awarded the 2010 Battle E award.

On 11 October 2011, *De Wert*, along with the British Royal Fleet Auxiliary vessel RFA *Fort Victoria*, rescued the Italian vessel *Montecristo* after it was boarded by Somali pirates, while on joint anti-piracy operations in the Indian Ocean.<sup>\*[4]</sup>

*De Wert* was decommissioned on 4 April 2014.<sup>\*[5]</sup>

### 2.35.1 References

- [1] Smolinski, Mike (6 June 2009). "USS De Wert (FFG45)". *Frigate Photo Archive*. NavSource Naval History. Retrieved July 7, 2010.
- [2] De Wert Command History 1985, via History.navy.mil, DeWert
- [3] Ludwick, Paula M., MC1 (February 19, 2007). "Surface Force Ships, Crews Earn Battle "E"". United States Navy. Retrieved 6 July 2010.
- [4] "UK and US forces 'rescue pirate-held Italian ship'". BBC News. October 11, 2011.
- [5] [http://www.navy.mil/submit/display.asp?story\\_id=80141](http://www.navy.mil/submit/display.asp?story_id=80141)

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### 2.35.2 External links

- USS *De Wert* official website
- navysite.de: USS *De Wert*
- MaritimeQuest USS DeWert FFG-45 pages
- Photo gallery of USS *De Wert* (FFG-45) at Nav-Source Naval History

## 2.36 USS Rentz (FFG-46)

**USS Rentz (FFG-46)** was an *Oliver Hazard Perry*-class of guided missile frigate, of the United States Navy, the 40th ship to be constructed of its class. The *Rentz* was named after World War II Navy Chaplain George S. Rentz (1882–1942). Rentz was posthumously awarded the Navy Cross for actions following the loss of USS *Houston* in the Battle of Sunda Strait. He was the only Navy chaplain to be so honored during World War II.

### 2.36.1 History

The keel of *Rentz* was laid on 18 September 1982 at Todd Pacific Shipyards, Los Angeles Division, San Pedro, California. She was launched 16 July 1983, sponsored by Mrs. Jean R. Lansing, daughter of Chaplain Rentz, and commissioned at Naval Station Long Beach on 30 June 1984 under the command of CDR Martin Jules Mayer (b. 1944).<sup>\*[1]</sup> In attendance were survivors of *Houston*, as well as Chaplain Rentz's surviving daughter.

In December 1985, *Rentz* moved from Long Beach, California to San Diego, California where it was based until it was decommissioned. Following initial shakedown cruises and operations, *Rentz* was assigned to the USS *Ranger* aircraft carrier group. As part of that group, the ship regularly cruised the Southern California Operations Area off the coast of San Clemente Island with a pair of fuzzy dice dangling above the ship's computerized helm. During "breakaways" after underway replenishment (UNREP) at sea, *Rentz* blasted the Beach Boys song "Little Deuce Coupe" as its inaugural "UNREP breakaway song."

On 5 November 1986, *Rentz* was part of an historic visit to Qingdao (Tsing Tao; 青島) China—the first US Naval visit to China since 1949. *Rentz* was accompanied by two other ships, the *Reeves* and *Oldendorf*. The visit was officially hosted by the Chinese People's Liberation Army Navy (PLAN).<sup>\*[2]</sup> Previously, USS *Dixie* was the last ship to moor in China, departing in 1949 when the communists forced the Americans to leave the Chinese mainland.

In July 1987, *Rentz* was sent to the Persian Gulf as part of Operation Earnest Will. Her primary duties consisted of

escorting commercial vessels through the Strait of Hormuz. “Rentz” provided missile security escort for the North Persian Gulf Battlegroup destroyers during their transit in and out of the Straits of Hormuz en route to an operation code name “Nimble Archer” involving naval gun bombardment and SEAL Team take over of an abandoned oil rig being used by the Iranian Revolutionary Guard to stage attacks on Persian Gulf shipping. *Rentz* has been deployed to the Gulf numerous times since 1987.

On 28 November 2009 while the ship was moored in **Jebel Ali, United Arab Emirates** as part of the *Nimitz* carrier strike group, a crewman was killed while performing repairs to the ship. According to the Navy, Petty Officer 3rd Class David M. Mudge\*[3] was electrocuted while working in an auxiliary machinery space.\*[4] In response to the mishap, the Navy ordered the entire fleet to inspect ship electrical enclosures.\*[5]

In December 2013, *Rentz* intercepted a small drug smuggling vessel in the **United States Fourth Fleet** area of responsibility as part of an anti-drug trafficking operation. The vessel contained approximately 313 kilograms of **Cocaine** worth an estimated \$10.4 million. This was the fourth successful bust, bringing the total amount of cocaine intercepted by *Rentz* to approximately 3,000 kilograms.\*[6]

### Awards

- “outstanding food service” in the Pacific Fleet, 1997 **Ney** Award winner “Small Afloat.”
- “outstanding food service” in the Pacific Fleet, 2000 **Ney** runner-up “Small Afloat.”
- *2003 Mobility Energy Efficiency* award from the Federal Emergency Management Agency.

### 2.36.2 The Ship's Crest

The colours blue and gold are traditionally associated with the U.S. Navy. The vertical trident represents the sea god **Neptune**. The crossed missiles indicate the type of ship “Frigate with Guided Missiles.” The cross on the shield symbolizes the ship’s namesake, Chaplain Rentz. The motto “Dread Nought” tells all to have no fear for the ship is watched over by higher powers.

### 2.36.3 Commanding Officers\*[7]

- CDR Martin J. Mayer (30 June 1984 – 22 November 1986)
- CDR James A. Hooper IV (22 November 1986 – 15 December 1988)

- CDR Kenneth S. Jordan (15 December 1988 – 19 December 1990)
- CDR Daniel E. Busch (19 December 1990 – 24 July 1992)
- CDR Bruce T. Van Belle (24 July 1992 – 6 May 1994)
- CDR Robert E. Johnston (6 May 1994 – 12 July 1995)
- CDR Gregory J. Allen (12 July 1995 – 10 June 1997)
- CDR John B. Sturges III (10 June 1997 – 6 June 1998)
- CDR Benjamin F. Roper (6 June 1998 – 10 December 2000)
- CDR Michael R. Mara (10 December 2000 – 29 June 2001)
- CDR Thomas R. Beall (29 June 2001 – 7 February 2003)
- CDR Jeffrey D. Frederick (7 February 2003 – 9 July 2004)
- CDR Dominic DeScisciolo (9 July 2004 – 28 April 2006)
- CDR Mark E. Johnson (28 April 2006 – 4 April 2008)
- CDR David T. Glenister (4 April 2008 – 13 November 2009)
- CDR Jeffrey A. Miller (13 November 2009 – 20 April 2011)
- CDR Michael F. Davis (20 April 2011 – 19 October 2012)
- CDR Lance C. Lantier (19 October 2012 – 23 May 2014)

### 2.36.4 References

- [1] Nguyen, Lisa. “Martin Mayer Collection (AFC/2001/001/49389), Veterans History Project” . Library of Congress. Retrieved 18 September 2008.
- [2] “After 37-year absence, U.S. vessels visit China” . *New York Times*: A3. 6 November 1986.
- [3] ”
- [4] *Military Times*, "Rentz sailor electrocuted aboard ship", 30 November 2009.
- [5] Liewer, Steve, “Sailor’s Death Prompts Navy To Act” , *San Diego Union-Tribune*, 11 January 2010.

- [6] [http://www.public.navy.mil/surfor/ffg46/Pages/USSRentzIntercepts313KilogramsOfCocaineWorthMorethanprotect\xunadd\\_text\\_character:nN{\textdollar}{\\\$}10Million.aspx#.VGzHf2dkxRU](http://www.public.navy.mil/surfor/ffg46/Pages/USSRentzIntercepts313KilogramsOfCocaineWorthMorethanprotect\xunadd_text_character:nN{\textdollar}{\$}10Million.aspx#.VGzHf2dkxRU)
- [7] "Decommissioning Ceremony: USS RENTZ (FFG 46)". <http://www.archive.org>. United States Navy. External link in \website= (help)

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USS Nicholas during her acceptance trials in 1984

### 2.36.5 External links

- [USS Rentz official website](#)
- [Photo gallery of USS Rentz \(FFG-46\) at NavSource Naval History](#)
- [USS Rentz cruise books](#)
- [navysite.de: USS Rentz](#)
- [USS Rentz at Destroyer History](#)
- [U.S. NAVY HELO CREW RESCUED BY USS RENTZ, COMNAVAIRPAC Press Release 1997: PR97-015](#)
- [MaritimeQuest USS Rentz FFG-46 pages](#)
- [Defense Visual Information Center \(search for "Rentz"\)](#)
- [Decommissioning booklet for USS Rentz](#)

hull displaces 4,100 tons and her gas turbine power develops 41,000 shp (31,000 kW) for a single screw, giving a top speed of 29 plus knots.

Since her commissioning, *Nicholas* has deployed to the Persian Gulf, Mediterranean and North Sea, as well as participating in maritime interdiction operations and various fleet exercises. During her first four years as a commissioned vessel, she earned three Battle Efficiency "E" awards, and the Battenberg Cup as the best ship in the Atlantic Fleet. She earned the Top Ship award from Commander Battle Force Sixth Fleet during her first deployment to the Mediterranean.



Standard missile shot against a supersonic target off Puerto Rico in 1984

## 2.37 USS Nicholas (FFG-47)

For other ships of the same name, see [USS Nicholas](#).

**USS Nicholas (FFG-47)**, an *Oliver Hazard Perry*-class frigate, was the third ship of the United States Navy to be named for Major Samuel Nicholas, the first commanding officer of the United States Marines. A third-generation guided missile frigate of the Oliver Hazard Perry class, she was laid down as [Bath Iron Works](#) hull number 388 on 27 September 1982 and launched 23 April 1983. Sponsor at her commissioning there on 10 March 1984 was the same Mrs. Edward B. Tryon who sponsored DD 449 in 1942.

*Nicholas* was designed to provide in-depth protection for military and merchant shipping, amphibious task forces, and underway replenishment groups. Her 453-foot (loa)

### 2.37.1 1980s

During her first years, *Nicholas* was part of Destroyer Squadron Six in Charleston, South Carolina. her sister ships in DESRON SIX included [USS Taylor](#) and [O'Bannon](#), which harkened back to the World War II *Fletcher*-class destroyers *Nicholas*, *Taylor*, and *O'Bannon*. These ships had such distinguished records in World War II, especially in the Solomon Islands campaign, that Admiral Halsey ordered all three ships be

present with USS *Missouri* at the Japanese surrender in Tokyo Bay.

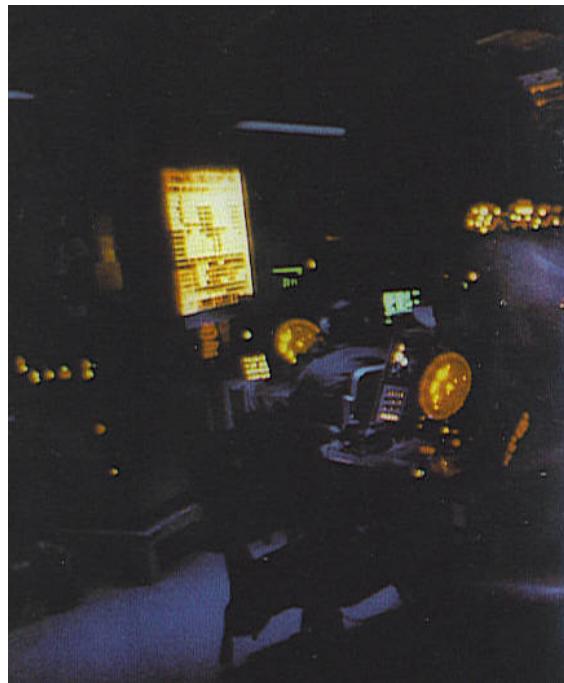
In July 1987, *Nicholas*, together with DESRON SIX sister ship *Deyo*, deployed with the *Iowa* Battleship Battle-group to the Mediterranean. She was deployed to the Persian Gulf in 1988 during the Iran-Iraq War, where she participated in Operation Earnest Will, which was a mission to escort reflagged tanker ships. She earned her first Armed Forces Expeditionary Medal.

### 2.37.2 1990s

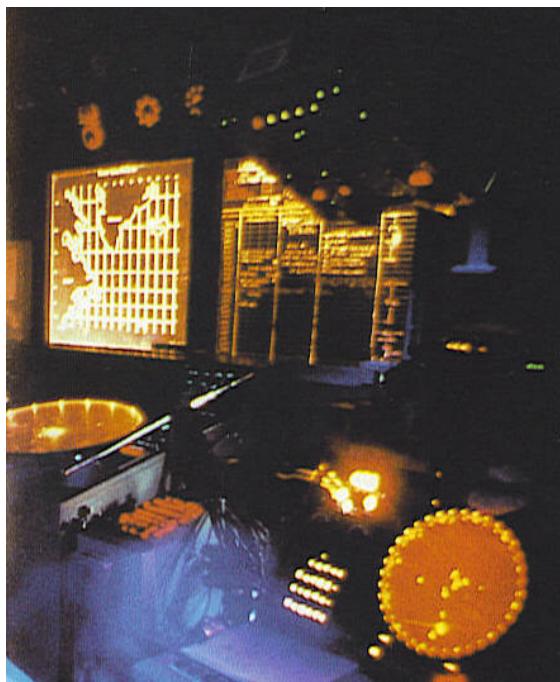
See also: Battle of Ad-Dawrah

When hostilities with Iraq broke out during the Gulf War on 17 January 1991, *Nicholas* was serving in the extreme Northern Persian Gulf as an advance Combat Search and Rescue platform, more than 70 miles (110 km) forward of the nearest allied warship. During the first few weeks of the war she attacked Iraqi positions off the coast of Kuwait, capturing the first of 23 Iraqi prisoners of war, sinking or damaging seven Iraqi patrol boats, destroying eight drifting mines and rescuing a downed USAF F-16 pilot from the waters off the Kuwaiti coast. *Nicholas* also escorted the battleships *Missouri* and *Wisconsin* during naval gunfire support operations near Khafji off the coast of Saudi Arabia and Kuwait.

and the Former Republic of Yugoslavia. During these operations, she safely conducted over 170 boardings of merchant vessels to inspect for illegal cargo shipments.



Weapons control operators (WCO) area of the ship's combat information center (CIC)



Air tactical control operators (ATACO) area of the ship's combat information center (CIC)

In her 1993 six-month deployment, *Nicholas* conducted operations in the Red Sea, Mediterranean, Ionian Sea and Adriatic Sea. This deployment was in support of the United Nations sanctions against the governments of Iraq

In 1995, *Nicholas* deployed to the Adriatic and was assigned to the Standing NATO Force Atlantic, again operating in support of United Nations resolutions in Operation Sharp Guard. She intercepted over 120 vessels in enforcing sanctions against the Former Republic of Yugoslavia. In September 1995 *Nicholas* located and rescued Albanian citizens seeking clandestine entrance across the Adriatic into Italy. Their boat was found capsized after reportedly being run over by a ferry ship and catching on fire in the night. Many sustained injuries, burns and were severely dehydrated. The ship's SAR swimmer with the assistance of the deck crew rescued 16 survivors including a four-year-old girl and her mother. Three bodies of deceased members of the group were also recovered with assistance from helicopter operations. All survivors were given immediate medical attention, water and food and brought safely back to port for full recovery.

### 2.37.3 2000s

The 2001 deployment took *Nicholas* to the Mediterranean and Persian Gulf. While in the Mediterranean, she conducted numerous boardings in support of United Nations sanctions. On 11 September, *Nicholas* sortied on an emergency basis from Valletta, Malta and conducted sustained underway operations until returning to her home port of Norfolk, Virginia six months later.

In 2003 the vessel became the first warship to enter



USS Nicholas plowing through a wave.

Neum, Bosnia since 1917, and the first U.S. warship ever. While there, *Nicholas* hosted the Bosnian Tri-Presidency and numerous government and military officials.

*Nicholas* operated as the sole US warship in the Mediterranean for her six-month deployment and acted as a surrogate for the Argentina ship *Sarandi*, enhancing international relations and building new alliances. She participated in multiple exercises and operations and achieved historic distinction when she tracked and assisted in the interception of a merchant ship loaded with nuclear centrifuges bound for Libya. US Government officials directly linked the interception of this vessel to the abandonment of Libya's nuclear weapons program.

*Nicholas* deployed again in 2005 on a 3-month cruise, making port calls in Spain, Denmark, France and Greece. In 2006 she deployed once more to the Persian Gulf, conducting patrols around the Iraqi oil terminals Kaot & Abot, alongside USS *McFaul*, HMAS *Ballarat*, and other coalition warships. In 2008 *Nicholas* deployed once more as part of the Standing NATO Maritime Group-1.

## 2.37.4 2010s

On 1 April 2010, *Nicholas* came under fire from Somali pirates while deployed in the waters off of East Africa near the coast of Kenya and Somalia conducting anti-piracy operations. *Nicholas* seized five pirates, sank their skiff and captured a pirate mother ship.\*[1] The pirates were tried in the U.S. and convicted of piracy, which carries a mandatory life sentence.\*[2]\*[3] Five Somali men were sentenced to life plus 80 years in prison for engaging in piracy and related offenses in last year's attack on a U.S. warship in the Indian Ocean. In November, a federal jury in Virginia convicted the Somali men – Mohammed Modin Hasan, Gabul Abdullahi Ali, Abdi

Wali Dire, Abdi Mohammed Gurewardher and Abdi Mohammed Umar – of piracy, attack to plunder a vessel, act of violence against persons on a vessel, assault with a dangerous weapon, assault with a dangerous weapon on federal officers and employees, conspiracy to use firearms during a crime of violence, and multiple firearm counts, including the use of a rocket propelled grenade.\*[4]

## 2.37.5 Awards

*Nicholas* has earned the Combat Action Ribbon, Southwest Asia Service Medal (with three bronze stars), Armed Forces Expeditionary Medal, the NATO Medal, Kuwait Liberation Medal (Saudi Arabia), Kuwait Liberation Medal (Kuwait), Armed Forces Service Medal, Sea Service Ribbon (with seven bronze stars), Meritorious Unit Commendation, a Coast Guard Meritorious Unit Commendation (with O for Law Enforcement), and six Battle Efficiency "E" awards as top ship in her squadron.\*[5]

## Decommissioning

On March 10 2014 Commander Cory Blaser (Commanding Officer) of USS *Nicholas* FFG-47, decommissioned USS *Nicholas* at Naval Station Norfolk, Virginia 30 years to the date of commissioning on March 10th 1984.

## 2.37.6 References

- [1] Nelson, Katie (1 April 2010). "U.S. Navy captures 5 Somali pirates; seizes pirate mother ship off Kenya, Somali coasts". *New York Daily News*. Retrieved 1 April 2010.
- [2] Mackey, Robert (24 November 2010). "Somali Pirates Convicted in Virginia". *New York Times*. Retrieved 28 November 2010.
- [3] "Convicted Somali pirates get life sentences in US court". *BBC News*. BBC. 14 March 2011. Retrieved 14 March 2011.
- [4] "Five Somalis sentenced to life in piracy case". CNN. 15 March 2011. Retrieved 16 March 2011.
- [5] Dunham, Daniel N.; Smolinski, Mike (10 January 2012). "USS Nicholas (FFG 47)" (Navsource Online: Frigate Photo Archive). NavSource Naval History. Retrieved 12 September 2013.

*This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here. This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here.*

### 2.37.7 External links

- USS *Nicholas* official website
- Photo gallery of USS *Nicholas* (FFG-47) at NavSource Naval History
- navysite.de: USS *Nicholas*
- MaritimeQuest USS *Nicholas* FFG-47 pages

## 2.38 USS Vandegrift (FFG-48)

**USS Vandegrift (FFG-48)** was an *Oliver Hazard Perry*-class frigate of the United States Navy. The ship was named for General Alexander A. Vandegrift (1887–1973), 18th Commandant of the Marine Corps.

*Vandegrift* was laid down on 13 October 1981 at Todd Pacific Shipyards, Seattle, Washington. She was launched on 15 October 1982\*[1] —cosponsored by Ms. Courtney A. Vandegrift, Ms. Stephanie S. Vandegrift, and Ms. Daphne L. Vandegrift, three of the late Gen. Vandegrift's granddaughters, and Ms. Serina N. S. Vandegrift, his great granddaughter.\*[2]\*[3] *Vandegrift* was commissioned on 24 November 1984; Commander Clinton James Conaway in command;\*[2]\*[4] and, after over 30 years of service, decommissioned on 19 February 2015.\*[1]

### 2.38.1 1980s

The ship's inaugural cruise began on 5 January 1987. During the course of this around-the-world cruise, she sailed three oceans, seven seas and visited four continents. The plank owners also crossed the International Date Line, Equator, Greenwich Meridian, and sailed through the Strait of Gibraltar, and the Suez and Panama Canals. *Vandegrift* conducted operations with USS *Kitty Hawk* in the Arabian Sea and Indian Ocean. These operations were highlighted by an air and sea power demonstration for president Muhammad Zia-ul-Haq of Pakistan. Port visits included Pearl Harbor; Subic Bay in the Republic of the Philippines; Karachi, Pakistan; Mombasa, Kenya; Maxime, France; Roosevelt Roads, Puerto Rico; and St. Croix and St. Thomas, U.S. Virgin Islands. *Vandegrift* returned home to Long Beach in June 1987.\*[1]

The ship's second deployment began in June 1988, returning her to operations in the Persian Gulf shortly after the cease-fire between Iran and Iraq. *Vandegrift*'s mission while on patrol in the northern Persian Gulf focused on providing protection and logistic support for joint forces in the area. *Vandegrift* also participated in numerous Earnest Will missions, escorting U.S. and re-flagged Kuwaiti tankers. Port visits included Pearl Harbor; Subic Bay, Republic of the Philippines; Bahrain; Pattaya Beach, Thailand and Hong Kong. *Vandegrift* returned home in December 1988.\*[1]

### 2.38.2 1990s

The ship's third deployment to the Persian Gulf began in March 1990. *Vandegrift* patrolled the Northern Persian Gulf and conducted Earnest Will escort missions. As the senior ship on station in the Persian Gulf during the invasion of Kuwait, *Vandegrift* served as the Anti-Air Warfare Commander and Electronic Warfare Coordinator. *Vandegrift* participated in Operation Desert Shield's Maritime Interception Operations with units from United Kingdom, Saudi Arabia, the United Arab Emirates and France. Ports of call included Pearl Harbor; Subic Bay; Phuket, Thailand; Singapore and Hong Kong. *Vandegrift* returned home after an extended deployment in October 1990.\*[1]

On 22 April 1992, *Vandegrift* began her fourth deployment to the Persian Gulf. *Vandegrift* participated in exercises with India, Qatar and Pakistan, helping to strengthen U.S. relations in that area. Ports of call included Doha, Qatar; Dubai, Jebel Ali and Abu Dhabi, United Arab Emirates; Karachi, Pakistan; Phuket, Thailand; Goa, India; Bahrain; Hong Kong; Singapore and Guam, and earned the Chief of Naval Operations LAMPS Helicopter Safety Award.\*[1] *Vandegrift* returned home on 22 October 1992.

From 1 January to 3 February 1993, *Vandegrift* was homeported in Long Beach, CA.\*[5] Due to extensive shipyard time and the closing of Naval Station Long Beach, from 3 February 1993, *Vandegrift* was homeported in San Diego, CA. From 1 January to 2 April, *Vandegrift* was commanded by Commander Theodore L. Kaye. From 2 April to 31 December, *Vandegrift* was commanded by Commander David C. Harrison. From 1 January to 31 July, *Vandegrift* was under the administrative command of Commander, Destroyer Squadron 9. From 31 July to 31 December, *Vandegrift* was under the administrative command of Commander, Destroyer Squadron 33.

The ship earned the COMNAVSURFPAC Food Service Award in March 1994. The fifth deployment to the Persian Gulf began on 25 October 1994. *Vandegrift*'s mission was the enforcement of UN sanctions against Iraq in the Northern Persian Gulf. The most memorable event was conducting a non-permissive boarding of a sanctions violator on 25 December. During the return transit, *Vandegrift* played host to a major diplomatic reception in Muscat, Oman, to better diplomatic relations. Ports of call included Sasebo, Japan; Manila, Republic of the Philippines; Jebel Ali, United Arab Emirates; Bahrain; Singapore and Hong Kong. *Vandegrift* returned home on 25 April 1995.\*[1]

In 1998, the ship shifted homeports to Yokosuka, Japan.\*[1] Between 1998 and 2000, the ship performed numerous cruises to South Korea, Thailand, China, Singapore, the Marianas Islands, Australia, and conducted a RIMPAC deployment to Hawaii in company with the

Japanese Navy. In 1999, the vessel was visited by Admiral Jay L. Johnson, then Chief of Naval Operations (CNO).

### 2.38.3 2000s

In January 2003, *Vandegrift* deployed for the eighth time to the Persian Gulf in support of Operation Iraqi Freedom/Operation Enduring Freedom. Assigned escort operations in the Straits of Hormuz, *Vandegrift* conducted over 50 transits, safely escorting over 78 vessels carrying over 1 million tons of hardware in support of Operation Iraqi Freedom. Additionally, *Vandegrift* seized two Iraqi mine-laying vessels in the Southern Persian Gulf and was credited with protecting the Coalition's flank from planned mine-laying operations.\*[1]

On 19 November 2003, the frigate became the first US warship to enter Vietnamese waters since April 1975.\*[6]

The ship's decorations include the Meritorious Unit Commendation, National Defense Service Medal, Armed Forces Expeditionary Medal; Southwest Asia Service Medal, and five Sea Service Ribbons.\*[1]

As of 2006, *Vandegrift* was based in San Diego, California.\*[1]

### 2.38.4 2010s

In March 2014, Eric and Charlotte Kauffman, and their daughters, three-year-old Cora and one-year-old Lyra, set sail from San Diego, California, to circumnavigate the globe in their 36-foot sailboat, *Rebel Heart*. Lyra fell sick, however, and on 3 April the family sent a distress call, from a position hundreds of miles off the Mexican coast. A Lockheed MC-130P Combat Shadow of the California Air National Guard's 130th Rescue Squadron, 129th Rescue Wing, flew out to the area and four pararescuemen jumped into the water, climbed on board the sailboat and medically treated and stabilized Lyra. *Vandegrift* reached the area on 5 April, and at about 0800 the following morning, she lowered a team in a rigid hull inflatable boat (RHIB), and the sailors brought the family and the pararescuemen on board the frigate. The rescuers provided the Kauffmans with food, water, and medical assistance, but instructed the castaways that because of the limited room on board the RHIB and ship, they could only retrieve three bags of their personal belongings in a single trip before *Vandegrift* sank *Rebel Heart* as a hazard to navigation. Some of the Kauffman's neighbors in the San Diego area therefore raised funds and donated goods to help the family recover from their ordeal when they returned ashore.\*[2]\*[7]\*[8]

From 1 May to 28 November 2012 *Vandegrift* participated in a CARAT deployment, visiting Russia, Japan, Cambodia, Malaysia, and other Pacific nations.

*Vandegrift* returned from its final deployment on 12 De-

cember 2014, where she operated in the U.S. Naval Forces Southern Command/U.S. 4th Fleet area of responsibility (AOR). During this final deployment, *Vandegrift* was part of the counter-transnational organized crime (C-TOC) mission **Operation Martillo**, a joint, combined operation involving the U.S. and 14 European and Western Hemisphere partner nations, that targets illicit trafficking routes in the waters off Central America. While participating in Operation Martillo, *Vandegrift* intercepted approximately 8,996 kg of cocaine. The ship also participated in three community relations (COMREL) projects in **Panama City** during which 36 sailors helped build a workshop for the blind, assist an outreach group in refurbishing their building and spent time with children in the Aid for AIDS community.

After returning from her last deployment, the crew began to make preparations for decommissioning. After over 30 years of service, *Vandegrift* was decommissioned on 19 February 2015 at Naval Base San Diego.\*[9]

### 2.38.5 References

- [1] "Our History". *USS Vandegrift FFG-48*. Archived from the original on 4 October 2012. Retrieved 21 February 2015.
  - [2] Evans, Mark L. (19 August 2015). "Vandegrift (FFG-48)". Naval History and Heritage Command. Retrieved 6 January 2016.
  - [3] USS Vandegrift Public Affairs. "Ship's Sponsor Returns after 31 Years for Visit". Commander Naval Surface Force, U.S. Pacific Fleet. Retrieved 10 May 2015.
  - [4] "Distinguished guests attend the commissioning of the guided missile frigate USS Vandegrift (FFG 48)". *Records of the Office of the Secretary of Defense, 1921 - 2008*. National Archives. Retrieved 10 May 2015.
  - [5] Vandegrift Command History 1993
  - [6] Warth, Gary (19 February 2015). "Bittersweet farewell to Vandegrift frigate". *San Diego Union Tribune*. Retrieved 19 February 2015.
  - [7] Glass, Ira (9 May 2014). "Prologue". *Call for Help*.
  - [8] Stickney, R. (10 April 2014). "Baby Rescued at Sea Returns to San Diego". *NBC San Diego*.
  - [9] "USS Vandegrift Decommissioned At Naval Base San Diego". *XETV* (San Diego). City News Service. 19 February 2015. Retrieved 19 February 2015.
- This article incorporates public domain material from the United States Navy document "Our Ship"
  - 
  - *This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here.*

### 2.38.6 External links

- USS *Vandegrift* homepage
- Photo gallery of USS *Vandegrift* (FFG-48) at NavSource Naval History
- navysite.de: USS *Vandegrift*
- MaritimeQuest USS Vandegrift FFG-48 pages
- In pictures: US frigate's historic Vietnam visit (BBC News)
- USS *Vandegrift* command histories

## 2.39 USS Robert G. Bradley (FFG-49)

**USS Robert G. Bradley (FFG-49)**, an *Oliver Hazard Perry*-class frigate, is a ship of the United States Navy named for Lieutenant Robert G. Bradley (1921–1944), who was awarded the Navy Cross posthumously for his heroism on *USS Princeton* (CVL-23) during the Battle of Leyte Gulf.

*Robert G. Bradley*'s keel was laid down by Bath Iron Works Corp., Bath, Maine, on 28 December 1982. She was launched 13 August 1983, sponsored by Mrs. Edna D. Woodruff, mother of Lt. Bradley; commissioned 30 June 1984. Ship is homeported in Mayport, Florida. She was decommissioned in Mayport on March 28, 2014.

### 2.39.1 Service History

*Robert G. Bradley* has deployed to the Mediterranean (18 August 1986–7 March 1987; 4 November 1994–15 April 1995; and 28 June–21 December 1996); the Mediterranean and North Atlantic (5 January–2 July 1998); and the Middle East Force (Horn of Africa, Persian Gulf, 28 April–28 October 1988). In addition, she has made multiple law enforcement and counter-narcotics deployments to the Caribbean and eastern Pacific, and carried out a number of specialized operations in North American, Latin American, and European waters. The ship also took part in Operation Support Democracy: a UN attempt to restore order in Haiti (September–October 1993). *Robert G. Bradley* operated off Haiti's northern coast, tracking an average of more than 150 ships per day. During the ship's deployments, she normally embarked one or two Sikorsky SH-60B Seahawks of Helicopter Antisubmarine Squadrons (Light) (HSL) 42, 46, or 48.

*Robert G. Bradley* intercepted fishing vessel *Recuerdo*, smuggling 9.2 short tons (8.3 t) of cocaine, in the eastern Pacific (3 August 2001). She subsequently turned over the suspects and their illicit cargo to U.S. and Panamanian law enforcement authorities. *Robert G. Bradley*

then intercepted a go fast carrying 1.2 short tons (1.1 t) of cocaine (3 September). The ship sank the go fast, and turned over the narcotics and the four smugglers to coastal patrol ship *Hurricane* (PC-3), which transferred them to U.S. law enforcement authorities. In company with destroyer *David R. Ray*, *Robert G. Bradley* monitored and boarded fishing vessel *Lillian I*, took the boat under tow when she developed engine trouble, and brought her 13 crewmembers ashore (24 September–5 October).

*Robert G. Bradley*'s (2 June–2 September 2003) counter-narcotics deployment to the Caribbean and eastern Pacific proved especially eventful. The ship operated as the on-scene commander for the search and rescue of fishing vessel *Fufu Chen* and her nine crewmembers off the Costa Rican coast (17–19 July). Fishing boat *Costa del Sol* transferred three survivors for treatment to *Robert G. Bradley*, and fishing vessel *Arelis* transferred a fourth person. The ship then shifted the survivors to the Costa Rican Coast Guard. Guided missile frigate *Rentz* transferred 19 narcotics smugglers she had apprehended to *Robert G. Bradley* in Panamanian waters, which then turned them over to the U.S. Drug Enforcement Agency (8–13 August).

The ship next intercepted and boarded fishing vessel *Llanero*, which flew the Nicaraguan flag without proper documentation (26–27 August). Her boarding team discovered 1.85 short tons (1.68 t) of cocaine hidden in the hold, and apprehended eight smugglers. The inspectors determined that *Llanero* was unfit for the sea and sank her with GAU-16 fire from *Cutlass 472*, her embarked Seahawk, and 76 and 25 millimeter gunfire, 40 millimeter grenades, and .50 caliber fire from the ship ( $6^{\circ}29'4''N\ 83^{\circ}12'6''W / 6.48444^{\circ}N\ 83.20167^{\circ}W$ ). *Robert G. Bradley* and a U.S. Coast Guard Lockheed HC-130H "Hercules" chased a go fast that escaped into Colombian waters and beached herself on the Island de Providencia (30 August). The smugglers fled, but Colombian Coast Guardsmen recovered 1.3 short tons (1.2 t) of cocaine.

### 2.39.2 References

*This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here. This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here.*

### 2.39.3 External links

- USS *Robert G. Bradley* official website
- Photo gallery of USS *Robert G. Bradley* (FFG-49) at NavSource Naval History

- navysite.de: USS *Robert G. Bradley*
- MaritimeQuest USS Robert G. Bradley FFG-49 pages

*Taylor* was decommissioned on 8 May 2015, and is slated for transfer to Taiwan.\* [7]

## 2.40 USS Taylor (FFG-50)

For other ships of the same name, see [USS Taylor](#).

**USS Taylor (FFG-50)**, an *Oliver Hazard Perry*-class frigate, was a ship of the United States Navy named for Commander Jesse J. Taylor (1925–1965), a naval aviator who was awarded the Navy Cross posthumously for his heroism in the Vietnam War.

### 2.40.1 Construction

*Taylor*'s keel was laid down by Bath Iron Works Corp., Bath, Maine, on 5 May 1983. She was launched 5 November 1983, and commissioned 1 December 1984 in Bath, Maine. *Taylor* was sponsored by Barbara A. Taylor, the widow of the ship's namesake, and Diane Taylor-Oeland as matron of honor.

### 2.40.2 History

*Taylor* was homeported in Charleston, South Carolina from 1985–1993. The ship deployed to Northern Europe as part of the Standing Naval Forces Atlantic (STANAVFORLANT) in 1987 and the Persian Gulf in 1988 and 1990. Participated in Operation Earnest Will. In 1993, the *Taylor* changed homeport to Mayport, Florida with the closing of Charleston Naval Station.

Up to 2015, *Taylor* was homeported at NS Mayport, Florida, and was part of Destroyer Squadron 14.

In August 2008 *Taylor* entered the Black Sea conducting a pre-planned routine visit to the region to interact and exercise with NATO partners Romania and Bulgaria. It joined ships from Poland, Germany and Spain.\* [1]

In September 2010, *Taylor* was buzzed by a Russian Tu-95 bomber.\* [2] However, as of 2004, all significant anti-aircraft capability was deleted from this class. On 8 January 2014, *Taylor* left Naval Station Mayport for her last 7-month deployment to the U.S. 5th and 6th Fleets. On 5 February 2014, *Taylor* was scheduled to enter the Black Sea along with *Mount Whitney* in support of the Sochi Olympics.\* [3]

On 12 February 2014, *Taylor* ran aground while mooring in Samsun, Turkey during operations supporting the 2014 Winter Olympics.\* [4] “A senior Turkish port official said the ship's propeller scraped the surface as it was mooring at Samsun.”\* [5] The ship's skipper, Commander Dennis Volpe, was subsequently relieved and reassigned.\* [6]

### 2.40.3 References

- [1] Tran, Mark (21 August 2008). “Russia suspends military cooperation with Nato” . *Guardian* (London). Retrieved 21 August 2008.
- [2] “DoD details Russian buzzing of U.S. frigate” . 17 September 2010. Retrieved 17 September 2010.
- [3] “U.S. Navy Warship In Black Sea Ahead of Sochi Olympics” . 5 February 2014. Retrieved 5 February 2014.
- [4] “USS Taylor being inspected after running aground off Turkey” . February 18, 2014. Retrieved February 18, 2014.
- [5] “U.S. Warship Deployed Near Sochi Runs Aground” . 19 Feb 2014. Retrieved 21 February 2014.
- [6] Beardsley, Steven, "Navy relieves USS Taylor's commander after ship ran aground", *Stars & Stripes*, 25 February 2014
- [7] “Six Things to Know About USS Taylor (FFG-50)”, U.S. Navy, retrieved 9 May 2015

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### 2.40.4 External links

- [USS Taylor official website](#)
- [Photo gallery of USS Taylor \(FFG-50\) at NavSource Naval History](#)
- [navysite.de: USS Taylor](#)
- [MaritimeQuest USS Taylor FFG-50 pages](#)
- [USS Taylor propeller accidents AIS tracks in Samsun-Turkey](#)

## 2.41 USS Gary (FFG-51)

For other ships of the same name, see [USS Gary](#).

**USS Gary (FFG-51)** is an *Oliver Hazard Perry*-class frigate in the United States Navy. She was named for Medal of Honor recipient Commander Donald A. Gary (1903–1977).

*Gary* was laid down on 18 December 1982 at Todd Pacific Shipyards, Los Angeles Division, San Pedro, California; launched on 19 November 1983, co-sponsored by Mrs. Dorothy G. Gary, widow of the late Cmdr. Gary, and Mrs. Joyce Leamer, the late Medal of Honor recipient's niece;\* [1] and commissioned on 17 November 1984 at Naval Station Long Beach, Commander Harlan R. Bankert Jr. in command.\* [2]

### 2.41.1 Background

*Gary* is the forty-fifth ship of the *Oliver Hazard Perry*-class of guided missile frigates. These ships were built to provide air, surface and sub-surface protection for underway replenishment groups, convoys, amphibious groups and other military and merchant shipping. While a capable surface combatant in these traditional warfare areas, *Gary*'s role has expanded from that of the early 1980s to meet the threats and contingencies of the 21st century. Being the smallest multi-mission surface combatant in the U.S. Navy, *Gary*'s shallow draft gives her an advantage over larger cruisers and destroyers in the littoral operations that have characterized recent conflicts.

*Gary*'s engineering plant is computer controlled and monitored, reducing the number of watchstanders required in the engineering spaces themselves. Two marine gas turbine engines provide propulsion. Digital electronic logic circuits and remotely operated valves are monitored in a central control station and make *Gary* capable of getting ready to get underway in less than ten minutes rather than the eight hours required by steam-powered ships.

One of the U.S. Navy's premiere anti-submarine warfare (ASW) platforms, *Gary* routinely deploys for bi-lateral ASW exercises and real-world contingency operations in the western Pacific and Indian Oceans. During **Operation Iraqi Freedom**, she displayed her versatility, deploying to the Arabian Sea, Persian Gulf, Gulf of Aden and Red Sea, conducting carrier escort and air defense, intelligence gathering and presence missions, terrorist interdiction operations, rescue at sea and escorted dozens of merchant and military supply ships through the Strait of Hormuz and Bab-el-Mandeb strait. From 1999 to 2007, *Gary* was forward-deployed to Yokosuka, Japan, as part of the United States Seventh Fleet. During 2007, *Gary* completed a hull-swap/crew-swap with *McCampbell* (DDG-85) and is now home-ported at Naval Station, San Diego.

### 2.41.2 Notable history

An Iranian mine damaged guided missile frigate *Samuel B. Roberts* in the Persian Gulf on 14 April 1988. On 18 April the U.S. launched retaliatory **Operation Praying Mantis** against the Iranian-occupied Rakhsh, Salman (Sassan), and Sirri-D (Nassr) oil platforms. *Gary* coordinated her efforts with naval aircraft while protecting Mobile Sea Bases Hercules and Wimbrown VII during



*Gary* in 2002, before removal of her missile launcher.

the fighting.\* [1] She even claimed to have shot down a Silkworm missile, but this was never officially credited nor was she officially commended for her actions due to political reasons at that time.\* [3]

While aircraft carrier *Kitty Hawk*, guided missile destroyer *Curtis Wilbur*, and *Gary*, with an embarked an SH-60B Seahawk of Helicopter Antisubmarine Squadron (Light) (HSL) 51 Detachment 5, passed through the Strait of Malacca, en route to the Indian Ocean, on 7 October 2001, they rescued five Indonesian fishermen from their sinking 40-foot fishing vessel.\* [1]

On 13 March 2003, *Gary*, with an SH-60B of HSL-51 embarked, assisted in the rescue of all eight Iraqi fishermen from dhow *Kaptain Muhamadat* when she lost steering and propulsion in heavy seas and capsized 20 miles south of the Iranian coast.\* [1]

On 9 February 2007 *Gary* docked at the Cambodian port of Sihanoukville. It is the first time since the Vietnam War that an American warship has docked in Cambodia.

In the summers of 2012 and 2014, *Gary* took part in the largest Rim of the Pacific multi-national naval exercise including 23 nations and over 40 ships.

While *Gary*, with a Coast Guard law enforcement detachment team embarked, deployed for **Operation Martillo** (Spanish for "Hammer"), a counter-narcotics patrol, in the Eastern Pacific Ocean, she intercepted a suspicious vessel on 4 January 2013. The Coast Guardsmen and Sailors from the ship's "visit, board, search, and seizure" (VBSS) team boarded the suspected smuggler and seized 600 pounds (270 kg) of cocaine with an estimated street value of \$22 million. "This was one of those vessels we were chasing in the dark," Leatrice Daniels, *Gary*'s embarked Naval Criminal Investigative Service (NCIS) agent explained, "There was great open communication with everybody involved. Everything just flowed, from pursuit to initial contact and boarding." The investigators deemed the smuggler a hazard to navigation and sank her. This case concluded a hectic week in which *Gary*'s crewmembers and Coast Guardsmen boarded three boats, disrupting more than 2,000 pounds (910 kg) of cocaine destined for the United States with a street value of

\$272 million.\*[1]

On the night of 8 January 2013, *Gary* encountered a small vessel loaded with cargo. The boat displayed several indicators that she was involved in illicit trafficking, and the VBSS team and the Coast Guardsmen boarded the vessel. While they searched the boat, she suffered a temporary steering casualty, rendering her dangerous to operate. *Gary* rigged a tow until the Americans and the mariners restored the boat's steering. The intervening time enabled the boarders to complete their search and they failed to discover any narcotics on board, and the vessel resumed her voyage two days later.\*[1]

The ship capped her deployment by seizing an additional vessel smuggling more than 2,200 pounds (1,000 kg) of cocaine valued at \$81 million. "It was a complex operation," Lt. (j.g.) Christian Gotcher, the ship's navigation officer, recalled, "involving a law enforcement boarding, boat and helicopter searches, precision driving, detainee handling, and multiple deck operations, but *Gary*'s crew proved they were fully capable of handling it and scored a big win."\*[1]

*Gary* was decommissioned on 23 July 2015 at Naval Base San Diego, California.\*[1]\*[4]

The ship will be inactivated on 5 August 2015 and then prepared for transfer to Taiwan.\*[5]

*Gary* appeared in the film adaptation of Tom Clancy's *The Hunt for Red October*.\*[6]

### 2.41.3 Coat of Arms

Shield: Azure escutcheon with blue chevron surmounted by gold Mer-lion holding a three-bladed ship's propeller proper under an inverted rocker of five argent stars. Crest: On a wreath of the colors gold and azure a demi-sun gules below a fire-bomb proper flanked by two green palm fronds and surmounted by a gold stockless anchor between two demi-arrows proper. Motto: On an azure scroll in doubled gold the motto "Freedom's Foremost Guardian."

#### Symbolism

Shield: The light blue "V" shape represents the Medal of Honor ribbon as it rests on the dark blue of the Navy uniform. The "V for Victory" symbol was also used extensively during World War II at the time then-Lieutenant Gary was awarded the Medal of Honor. The five stars are from the medal service ribbon. The Merlion, a legendary seafaring creature, represents the courage shown by Lieutenant Gary when he saved hundreds of his shipmates from a violent death at sea. The ship's propeller denotes that he was an Engineering Officer, who as such went back into the number 3 fireroom at great personal risk to direct the raising of steam to get the carrier *Franklin* underway after it was without power for several hours due to extensive damage from enemy action.

Crest: The stockless anchor is one of the distinguishing features of the Navy's Medal of Honor and is also an ancient symbol of the sea. The fire-bomb with three flames denotes the three times Lieutenant Gary braved fire and exploding bombs to lead several hundred men to safety. The arrowheads are a traditional warrior symbol indicative of the warship *Gary*. The setting sun is symbolic of the location of the battle off the coast of Kure, Japan in which Lieutenant Gary performed his heroic actions. The palm fronds are an age-old symbol of honor and also represent his service in the south Pacific theater.

### 2.41.4 References

- [1] Evans, Mark L. (28 July 2015). "Gary (FFG-51)". Naval History and Heritage Command. Retrieved 6 January 2016.
- [2] Smolinski, Mike (23 June 2008). "USS Gary (FFG51)". Frigate Photo Archive. NavSource Naval History. Retrieved 14 December 2011.
- [3] "America's First Clash with Iran: The Tanker War" by Lee Allen Zatarain, Chapter 17: Multiple Silkworms Inbound"
- [4] "USS Gary decommissioned at Naval Base San Diego". Fox 5. 24 July 2015. Retrieved 7 August 2015.
- [5] Crisp, Thomas (6 August 2014). "Navy decommissioning plan 2015 —farewell to the frigates". NewberryObserver.com. Retrieved 24 February 2015.
- [6] Navsource Online: Frigate Photo Archive, USS Gary (FFG-51)

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### 2.41.5 External links

- USS *Gary* official website
- Yokosuka Naval Base Community Website
- Photo gallery of USS *Gary* (FFG-51) at NavSource Naval History
- navysite.de: USS *Gary*
- MaritimeQuest USS *Gary* FFG-51 pages
- Eye on the Fleet Photo Gallery
- USS *Gary* News
- USS *Gary* command histories at the Naval History & Heritage Command

- USS Gary (FFG-51)
- *Gary's* VBSS Team training at Naval Station Pearl Harbor.

## 2.42 USS Carr (FFG-52)

**USS Carr (FFG-52)**, was an *Oliver Hazard Perry*-class frigate of the United States Navy, named after Gunner's Mate 3rd Class Paul H. Carr (1924–1944), who was awarded a posthumous Silver Star Medal for his heroism on board the destroyer escort *Samuel B. Roberts* during the Battle off Samar.

*Carr* was laid down on 26 March 1982 by the Todd Pacific Shipyards Co., Seattle Division, Seattle, Wash.; launched on 26 February 1983; sponsored by Goldie Carr Bensilhe, GM3 Carr's widow; and commissioned on 27 July 1985, Commander Robert J. Horne in command.

### 2.42.1 History

#### Operation Earnest Will

*Carr*'s original homeport was in Charleston, South Carolina. Her first operational deployment was to the Persian Gulf, where *Carr* was involved in Operation Earnest Will, escorting re-flagged oil tankers through the Strait of Hormuz. While Commander, Destroyer Squadron 14, was the senior officer present, Commander Wade C. Johnson, the captain of *Carr*, was the next senior officer in the area and was routinely assigned the duties of Convoy Commander during escort missions. During one of these, Iranian small boats approached the tankers and were chased off by bullets from *Carr*'s deck-mounted M2 .50-caliber machine guns and the Bushmaster 25mm chain gun on the starboard main deck.

#### Bonefish disaster

*Carr* returned to Charleston in late March 1988, and 31 days later, was ordered underway to replace another ship that had been unable to get underway. Sent to sea to conduct anti-submarine exercises with the aircraft carrier *John F. Kennedy* and submarine *Bonefish*. On 24 April 1988, *Carr* was first on the scene to help rescue the crew of the attack submarine *Bonefish*, which had suffered a battery fire while submerged. Deploying her 26-foot whaleboat and five inflatable life rafts, *Carr* helped rescue 89 of *Bonefish*'s crew, using the whaleboat, life rafts, its embarked SH-60B Seahawk of Helicopter Squadron (Light) **HSL-44**, and the SH-3H Sea King helicopters from *John F. Kennedy*. The ship communicated to the land-based Commander, Atlantic Fleet watch center using the Joint Operational Tactical System's (JOTS) "op-note" capability. Crew muster lists were sent ashore as

rescued crew members were identified. For her professionalism in the rescue, *Carr* was awarded a Meritorious Unit Commendation.

#### Exercises in the Caribbean

In October 1988, *Carr* made a port visit to Tampa, Florida, at the request of the local Navy League chapter, mooring at Harbor Island pier. Public tours were held for several days in celebration of Navy Week, honoring the Navy's birthday. The commissioning commanding officer, Captain Robert Horne, was stationed at MacDill Air Force Base in Tampa and was there to greet the ship.

In March 1989, *Carr* was sent to Fleet Training Group, Guantanamo Bay, Cuba, for Refresher Training (REF-TRA). While the ship conducted exercises in all departments, Mikhail Gorbachev was making a visit to Havana, Cuba. News crews from NBC, headed by Henry Champ, and ABC, by Bob Zelnick, each spent a day aboard *Carr* to observe the training.

In summer 1989, while *Carr* was heading to the Puerto Rican Operation Area (PROA) for the Middle East Force Exercise (MEFEX), both of the ship's laundry washers broke down. With the permission of the Squadron Commodore running MEFEX, *Carr*'s Seahawk helicopter flew into Naval Station Roosevelt Roads, Puerto Rico, and the Supply Officer purchased a household washing machine from the Navy Exchange. The washer was unboxed on the ramp at the airfield, loaded in the helicopter and flown to the ship, where it was plumbed in to the water system and served as the crew laundry for the next several weeks.

#### Hurricane Hugo

On 18 September 1989, *Carr* sailed from Charleston to be on station off the Naval Station Mayport for the week to provide a practice flight deck for the SH-60B Seahawk squadrons. That night, an officer of HSL-44 came aboard and informed the captain that the helicopters would be flying to Georgia the following day in preparation for the impending arrival of Hurricane Hugo. On the morning of 19 September, *Carr* entered Naval Station Mayport and moored, awaiting further instructions. At midnight on the 20th, *Carr* got underway and headed south to the Strait of Florida to avoid the storm. Once the hurricane was safely past, the captain ordered the ship to sail towards Charleston.

*Carr* was the first Navy vessel to return to the port of Charleston the morning after Hurricane Hugo made landfall there. *Carr* remained anchored for three days, unable to enter port, as essentially all navigation aids were moved or destroyed by the hurricane. One of the Coast Guard ships at anchor sent a small boat to the USCG Station in Charleston, taking along *Carr*'s Sonar Technician Chief Petty Officer Steven Hatherly. STGC Hatherly made his

way to the Naval Station, where he phoned most of the crew's families and reported their status to the ship via bridge-to-bridge VHF radio that evening. From their anchorage, the crew could easily see the bridge between the Isle of Palms and the mainland in the air, as well as the demolished houses along the shore. Local television stations were returning the transmitting and the crew had little to do besides consider the condition of their families and possessions ashore.

*Carr* was ordered to proceed to Naval Station Mayport. Arriving the next morning, the local community had staged relief supplies to be taken to Charleston. The next day, *Carr* was directed to return to her homeport. Upon arrival, there were no shore services, so the Engineering Department kept the engineering plant on line to provide power, air-conditioning, fresh water and other support services. Crew members were dispatched, during the day, to assist in the clean up of the Naval Station, the Naval Weapons Station and the local community. As time permitted, they also helped each other's families secure their belongings and clean up their homes. For this response the natural disaster, *Carr* was awarded the Humanitarian Service Medal.

#### Change of command and return to the Persian Gulf

In early October 1989, the first formal ceremony of any type at the Naval Station held was the change of command for *Carr*, with Commander Edward "Ned" Bagley, III, USN relieving Commander Wade C. Johnson, USN. The Change of Command was held in the morning and that afternoon, Commander, Destroyer Squadron 4 held their change of command.

On 31 October, 1991 *Carr* sailed from Charleston for her second operation deployment, assigned to the Commander, Middle East Force. En route the Red Sea, *Carr* made port visits to the Alicante, Palma Majorca, Spain, Naples Italy, Athens Greece and Hiafa Israel, then transited the Suez Canal. During this deployment, *Carr* spent the first half assigned to tanker escort duties in the Strait of Hormuz and Maritime Interdiction Force in support of UN sanctions of Iraq. The later part of the cruise was spent operating in the Northern Red Sea, conducting electronic surveillance and early warning duties for the units operating to the south. *Carr* left the Red Sea the end of March 1991 and returned to Charleston a month later.

As of 2011, *Carr* was homeported at NAVSTA Norfolk, Virginia, and was part of Destroyer Squadron 22.

On 30 November 2012, *Carr* delivered 1.5 tons of cocaine and almost two tons of marijuana to Mayport, Florida, before continuing back to Norfolk.\*[1]

*Carr* was decommissioned on 13 March 2013.\*[2] The ROC Navy is expected to purchase the decommissioned ship and incorporate into its country's defense fleet.\*[3]

#### 2.42.2 References

- [1] "4TH Fleet Frigate Off-Loads \$114 Million in Drugs."
- [2] <http://www.navytimes.com/news/2012/03/navy-11-ships-to-be-decommissioned-in-fiscal-2013-031412w/>
- [3] <http://www.defensenews.com/article/20130106/DEFREG02/301060002/Congressional-Chaos-Costs-U-S-Navy-Millions-Leaves-Ships-Limbo?odyssey=tab%7Ctopnews%7Ctext%7CFRONTPAGE>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

#### 2.42.3 External links

- [USS Carr official website \(down\)](#)
- [navsource.org: USS Carr](#)
- [navysite.de: USS Carr](#)
- [MaritimeQuest USS Carr FFG-52 pages](#)

### 2.43 USS Hawes (FFG-53)

**USS Hawes (FFG-53)** is a later model *Oliver Hazard Perry*-class guided missile frigate. She is named for Rear Admiral Richard E. Hawes (1894–1968) who was twice decorated with the Navy Cross for submarine salvage operations. Any ship that bears his name is the only ship in the U.S. naval fleet that can fly the pirate flag, jolly roger, that RDML Hawes designed himself.\*[1]

#### 2.43.1 Built in Bath, Maine

The contract to build *Hawes* was awarded to Bath Iron Works, Bath, Maine, 22 May 1981, and her keel was laid 26 August 1983. She was launched 18 February 1984; sponsored by Mrs. Ruth H. Watson, widow of the late Rear Adm. Hawes; delivered 1 February 1985, and commissioned 9 February 1985, Commander Thomas F. Madden in command.\*[2]

#### 2.43.2 Service History

On 12 October 2000, *Hawes* was involved, along with *Donald Cook*, in providing repair and logistics support to *Cole*, shortly after she was attacked in Aden, Yemen. Two al-Qaeda terrorists brought an inflatable Zodiac-type speedboat that carried a bomb alongside guided missile destroyer *Cole*, while the ship refueled, and detonated their lethal cargo, killing 17 sailors and wounding 42 more. The crewmember's heroic damage control efforts saved *Cole*. *Hawes*, Cmdr. J. Scott



*USS Hawes (FFG 53) arrives at Naval Station Norfolk, 7 October 2009, after a six-month deployment in the Caribbean and western Atlantic Ocean supporting Operation Carib Venture. The jolly roger, that RDML Hawes designed can be seen.*

Jones in command, joined (13 October–19 November) other ships that took part in Operation Determined Response to assist *Cole* including: amphibious assault ship *Tarawa*; dock landing ship *Anchorage*; amphibious transport dock *Duluth*; guided missile destroyer *Donald Cook*; and the Military Sealift Command-operated tug *Catawba*; along with British frigates *Cumberland* and *Marlborough*. The Navy subsequently enhanced global force protection training during crucial transits, and sailors qualified to fire M60 and Browning .50 caliber M2 machine guns to defend against assaults by low-slow flying aircraft and small boats.\*[2]

*Hawes*, with Helicopter Antisubmarine Squadron (Light) HSL-48 Detachment 10 embarked, returned from a counter-narcotics deployment to the Caribbean and Western Atlantic to Naval Station Norfolk, Virginia, on 7 October 2009. The ship's operations resulted in the seizure of 200 barrels of cocaine.\*[2]

In July 2010, *Hawes* docked for five days at Pier 4 of the Charlestown Navy Yard, participating in a Navy Week coordinated alongside Boston's Harborfest.\*[3]

*Hawes*, operating with Destroyer Squadron 26 out of Norfolk, was decommissioned on 10 December 2010. She is moored, pending disposal, at the Naval Sea Systems

Command (NavSea) Inactive Ships On-Site Maintenance Office, Philadelphia, Pennsylvania.\*[2]

### 2.43.3 References

- [1]
- [2] Evans, Mark L. (14 July 2015). "Hawes (FFG-53)". Naval History and Heritage Command. Retrieved 8 January 2016.
- [3] The 2010 Boston Navy Week Schedule of Events

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here. This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here.*

### 2.43.4 External links

- USS *Hawes* official website
- Photo gallery of USS *Hawes* (FFG-53) at NavSource Naval History
- navysite.de: USS *Hawes*
- Boothbay Register story, 24 June 1999
- MaritimeQuest USS *Hawes* FFG-53 pages
- USS *Hawes* Decommissioning story 12/11/2010

## 2.44 USS Ford (FFG-54)

For other ships of the same name, see [USS Ford](#).

**USS *Ford* (FFG-54)**, an *Oliver Hazard Perry*-class frigate, is a ship of the United States Navy named for Gunner's Mate Patrick O. Ford (1942–1968). Ford was awarded the [Navy Cross](#) posthumously for his heroism as a patrol river boatman in the [Vietnam War](#).\*[1] A description of Gunner's Mate Ford's actions can be found here.\*[2]

### 2.44.1 Built in Los Angeles, California

*Ford* was laid down by Todd Pacific Shipyards, Los Angeles Division, San Pedro, California on 11 July 1983. She was launched on 23 June 1984; sponsored by Jonda McFarlane, wife of National Security Advisor Robert C. McFarlane; and commissioned 29 June 1985, captained by Commander J. F. Eckler. *Ford* was decommissioned 31 October 2013.\*[3]

## 2.44.2 Service history

*Ford* deployed on 28 November 1995, stopping first in San Diego to pick up Helicopter Anti-Submarine (Light) HSL 45 Detachment ONE, the embarking SH-60F Sea Hawk Detachment.\* [4] After a five hour stop *Ford* was underway to rendezvous with the *Nimitz* Battle Group under the command of Rear Admiral Lyle Bien, Commander, Carrier Group 7. The battle group then transited the Pacific Ocean from 2–20 December en route for Hong Kong. *Ford* participated in two ASW exercises with a US *Los Angeles*-class submarine and a new state-of-the-art Diesel submarine of the Japan Maritime Self-Defense Force. *Ford* remained part of the Carrier Group 7 battle-group during the events of the Third Taiwan Straits Crisis.

The guided missile frigate completed her first deployment during a voyage to the Western Pacific and Middle East Force (17 August 1987–17 February 1988). She took part in Operation Earnest Will, an operation to maintain freedom of navigation within the Persian Gulf, that included renaming and reflagging 11 Kuwaiti tankers.\* [1]

During a deployment to the Western Pacific, Persian Gulf, and Indian Ocean (13 November 1990 – 13 May 1991), *Ford* fought in Operation Desert Shield/Operation Desert Storm (28 January–18 March 1991). She alternated plane guard and “shotgun” duties for aircraft carriers *Midway*, *Ranger*, and *Theodore Roosevelt* during 34 continuous days of flight operations, and interdicted more than 90 merchant ships suspected of smuggling.\* [1]

On 16 February 2007, *Ford* was awarded the 2006 Battle “E” award.\* [5]

*Ford* completed a Cooperation Afloat Readiness and Training (CARAT) deployment starting 4 May 2007 and returning home on 20 September 2007. *Ford* made port visits to Japan, Philippines, Thailand, Malaysia, Singapore, Indonesia, Saipan, and Guam.

Inactivated on 19 August 2013, *Ford* was decommissioned 31 October 2013.\* [1]

## 2.44.3 References

- [1] Evans, Mark L. (8 July 2015). “Ford (FFG-54)”. Naval History and Heritage Command. Retrieved 8 January 2016.
- [2] History Provided By Ralph J. Fries, River Section 535 (9/67 – 6/68)
- [3] USS Ford Completes Final Underway
- [4] USS *Ford* Command History 1995
- [5] Surface Force Ships, Crews Earn Battle “E”

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here. This*

*article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here.*

## 2.44.4 External links

- USS *Ford* official website
- Photo gallery of USS *Ford* (FFG-54) at NavSource Naval History
- navysite.de: USS *Ford*
- MaritimeQuest USS *Ford* FFG-54 pages
- 

## 2.45 USS Elrod (FFG-55)

**USS Elrod (FFG-55)**, an *Oliver Hazard Perry*-class frigate, is a ship of the United States Navy named after Captain Henry T. Elrod (1905–1941), a Marine aviator who was posthumously awarded the Medal of Honor for his heroism in the defense of Wake Island in World War II.

The ship was originally home ported in Charleston, SC and shifted to Norfolk, VA in March 1995. *Elrod* has completed five deployments to the Persian Gulf, three to the Mediterranean Sea, and one to the Adriatic Sea, and has participated in numerous operations in the Atlantic Ocean, the Mediterranean Sea, the Black Sea and the Caribbean Sea.

## 2.45.1 Built in Bath, Maine

*Elrod* was laid down on 21 November 1983 at Bath, Maine, by Bath Iron Works; launched on 12 May 1984; sponsored by Mrs. Norma J. McDonald, wife of Admiral Wesley L. McDonald, Commander Atlantic Fleet and Commander Atlantic Command; and commissioned on 18 May 1985, Commander Richard W. Moore in command.\* [1]

## 2.45.2 Service History

An Iranian speedboat attacked South Korean tanker *Hyundai No. 7* with rocket propelled grenades near Abū Mūsā, 20 miles southwest of Sharjar, on 25 December 1987. *Elrod*, patrolling the Persian Gulf, launched *Magnum 442*, an SH-60B manned by pilot Lt. Neil W. T. Hogg, copilot Lt. Gregory P. Curth, and aircrewmen Aviation Antisubmarine Warfare Operator 2nd Class Charles Crissman and Aviation Antisubmarine Warfare Operator Airman Robert Bauch of Helicopter Antisubmarine Squadron (Light) (HSL) 44 Detachment 3. *Magnum*

442 rescued 11 of the 20 crewmembers and flew them to British frigate *Scylla*. A Westland Lynx HAS.3 from *Scylla* recovered the remaining nine people.\*[1]

*Elrod*'s third Persian Gulf deployment followed Operation Desert Storm and supported aggressive air and surface surveillance operations. *Elrod* conducted naval exercises with units of Gulf Cooperation Council nations to strengthen and further develop the bonds that were forged during Desert Shield and Desert Storm. The ship participated in TEAMWORK '92, NATO's Arctic Ocean anti-submarine exercise, and Operation Sharp Guard, in support of multi-national enforcement of United Nations sanctions and embagoing war materials to the Balkans. *Elrod* demonstrated America's commitment to her NATO allies by providing a presence among the Standing Naval Forces Mediterranean (SNFM) and Standing Naval Forces Atlantic (SNFL) during Operation Enduring Freedom. Recently, *Elrod* completed another NATO deployment in 2004 in support of Operation Active Endeavor, and helped protect the 2004 Summer Olympics in Athens, Greece, in Operation Distinguished Games.

*Elrod* deployed again in 2008, 2010, and 2012.

Pakistani fishing vessel *Al An Wari* sank in the Gulf of Aden on 2 July 2010. On 5 July, a Lockheed P-3C Orion of Patrol Squadron VP-16, forward-deployed to Djibouti, spotted the 16 survivors in a life raft about 144 miles west of Socotra Island. The "Orion" directed an SH-60B flying from *Elrod* to the area. The "Seahawk" rescued 12 of the mariners and the frigate reached the area and saved the remaining four men.\*[1]

Her 2012 Caribbean deployment resulted in the confiscation of record amounts of illegal narcotics.

The ship made her final deployment during a voyage to the Sixth Fleet in 2014, during which she steamed in the central Mediterranean as part of NATO's Operation Active Endeavour, patrols in support of the Global War on Terrorism, with the Northrop Grumman MQ-8 Fire Scout. Three armed Libyans seized commercial tanker *Morning Glory*, which Rear Admiral John Kirby, Pentagon Press Secretary, called a "stateless vessel," early in March 2014. The ship carried oil owned by the Libyan government's National Oil Corporation, but illicitly obtained from that country's port of As-Sidra. The Libyan and Cypriot governments requested assistance, and coalition forces, including guided missile destroyers *Roosevelt* and *Stout*, deployed as part of the George H. W. Bush Carrier Strike Group, responded. In addition, a Sea, Air, Land (SEAL) team, attached to Special Operations Command Europe, deployed to *Roosevelt*. The destroyer provided helicopter support and served as a command and control and support ship when, just after 1500 on 16 March, the SEALs boarded and took control of *Morning Glory* in international waters just southeast of Cyprus, capturing the hijackers and freeing the crewmembers. *Stout* dispatched a team of sailors that boarded the tanker

and relieved the SEALs, and which then helped sail the ship to Libyan waters. *Elrod* relieved *Stout* on 19 March. *Elrod* turned *Morning Glory* over to the Libyan authorities in international waters outside Libya, and they brought the ship into Zawiya, Libya, on 22 March.\*[1]

*Elrod* was decommissioned at Naval Station Norfolk, Virginia (USA), on 30 January 2015. The ship is slated to be offered in foreign military sales.\*[2]

### 2.45.3 Awards

In addition to a reputation for operational readiness and fighting skills, *Elrod* had earned a reputation for community support and participation in charitable projects. The ship has been recognized for the crew's contributions by designation as a Presidential "Point of Light". *Elrod* had also earned numerous awards during her commissioned service, including the Joint Meritorious Unit Award, Navy Meritorious Unit Commendation, Coast Guard Meritorious Unit Commendation, Armed Forces Expeditionary Medal, Humanitarian Service Medal, several Battle Efficiency Awards, Secretary of the Navy Energy Conservation Award, Armed Forces Recreation Society Award and various departmental and mission-specific awards for excellence.

### 2.45.4 Gallery

- *Elrod* underway, January 2004
- *Elrod* about to pass through the George P. Coleman Memorial Bridge on the York River, Virginia, Summer 2011
- USS ELROD one month prior to her decommissioning at Naval Station Norfolk. USNS Comfort and an Arleigh Burke class ship are visible in the background

### 2.45.5 References

- [1] Evans, Mark L. (7 July 2015). "Elrod (FFG-55)". Naval History and Heritage Command. Retrieved 8 January 2016.
- [2] [http://www.navy.mil/submit/display.asp?story\\_id=85397](http://www.navy.mil/submit/display.asp?story_id=85397)
- This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).
- This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found [here](#).

## 2.45.6 External links

- Photo gallery of USS *Elrod* (FFG-55) at NavSource Naval History
- USS *Elrod* official website
- navysite.de: USS *Elrod*
- MaritimeQuest USS Elrod FFG-55 pages

USS USS *Elrod* (FFG-55) command histories – Naval History & Heritage Command

- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004

## 2.46 USS Simpson (FFG-56)

For other ships of the same name, see USS Simpson.

**USS Simpson (FFG-56)** was an *Oliver Hazard Perry*-class guided missile frigate of the United States Navy, named for Rear Admiral Rodger W. Simpson.

## 2.46.1 History

*Simpson* was laid down at Bath Iron Works, Bath, Maine, on 27 February 1984, launched on 31 August 1984 sponsored by Mrs. Grace Fowles-Simpson<sup>\*[1]</sup> widow of Rodger W. Simpson and commissioned on 21 September 1985<sup>\*[2]</sup> in Newport, Rhode Island, with Cmdr. H. Wyman Howard Jr. in command. The ship was delivered 13 September 1985. Bath Iron Works plans called for delivery to occur 9 August 1985, but that date slipped due to an extended strike at BIW that began 30 June 1985.<sup>\*[3]</sup> *Simpson* was homeported at Naval Station Newport until switching to Naval Station Norfolk on 31 March 1994. *Simpson* moved to Naval Station Mayport in July 2001.<sup>\*[4]</sup>

### 1980s

On 28 January 1986, the John F. Kennedy Space Center, Florida, launched the space shuttle STS-51L Challenger at 1138. The shuttle's payload included NASA Tracking and Data Relay Satellite 2 and the Spartan-203 satellite. Escaping propellant combustion products cut into the craft's solid rocket booster, however, and 73 seconds after launch a massive explosion destroyed Challenger, killing all seven astronauts on board: naval aviator Cmdr. Michael J. Smith, and Francis R. Scobee, USAF, Ellison S. Onizuka, USAF, Judith A. Resnik, Ronald E. McNair, Gregory B. Jarvis, and S. Christa McAuliffe. Smith had graduated from the Naval Academy. *Simpson* took part in the ensuing search and rescue effort, and subsequently received the Coast Guard Unit Commendation with Operational "O" for her participation.<sup>\*[5]</sup>

Beginning January 1988, *Simpson*'s first overseas deployment was to the Persian Gulf as part of Operation Earnest Will, to escort reflagged Kuwaiti oil tankers during the Iran–Iraq War. On 17 April 1988, *Simpson* took part in Operation Praying Mantis, the U.S. response to the mining of the frigate *Samuel B. Roberts*, which had hit an Iranian M-08 mine on 14 April 1988.

On 18 April, *Simpson*, along with *Wainwright* and *Bagley*, destroyed Iranian naval and intelligence facilities on the oil platform Sirri in the Persian Gulf. Later that day, the ships encountered the Iranian Kaman-class (Combatte II type) missile patrol boat *Joshan*, which launched a Harpoon missile. *Simpson* immediately returned missile fire, striking *Joshan* in her superstructure. *Joshan* was then sunk by combined gunfire. *Simpson* was awarded the Joint Meritorious Unit Award and the Combat Action Ribbon for this operation, and the Armed Forces Expeditionary Medal for the deployment.

### 1990s

20 February 1990, *Simpson* rescued 22 crew members from *Surf City*, a reflagged Kuwaiti tanker carrying \$9

million in naphtha and gas oil. *Surf City* was transiting near the Iranian island of *Abu Musa* when it exploded, killing two and forcing the crew to abandon ship. According to Central Command, *Simpson* was not escorting the tanker, but was monitoring its progress from 3 nautical miles (5.6 km) away and responded immediately to rescue the crew.\*[6] The fire was so intense that US ships could not approach it and *Surf City* burned for two weeks. At the time, the fire was feared to be the result of an attack or a mine, but the NTSB later determined it to be an accident.\*[7]

In March 1992, during *Simpson*'s third deployment, *Simpson* and *Normandy* escorted *America* and two supply ships into the Persian Gulf. At the time, Iraq was refusing to comply with UN weapons inspection and the ships departed the Persian Gulf in early April after inspections resumed.\*[8]\*[9]

In August 1993 on *Simpson*'s fourth deployment she was again assigned to escort Carrier Group Six with *America*. During the deployment *Simpson* participated in Operation Deny Flight and Operation Provide Promise in the Adriatic Sea and supported Operation Continue Hope off Somalia. *Simpson* returned to homeport in February 1994.\*[10]\*[11]

In May 1994, *Simpson* was one of the ships enforcing United Nations sanctions on Haiti.\*[12]

*Simpson* deployed to the Caribbean Sea for counter drug operations in late 1994 and again in February 1995.\*[10]

In November 1995, *Simpson* deployed to the Mediterranean joining the United States Sixth Fleet NATO's Standing Naval Force Atlantic. *Simpson* operated in the Adriatic Sea enforcing UN arms embargo against Croatia and Bosnia-Herzegovina and participating in Operation Sharp Guard. *Simpson* returned to Norfolk 8 May 1996.\*[10]

## 2000s



*Simpson* arriving in New York Harbor, October 2004 prior to removal of Mk 13 launcher, but after removal of the STIR missile guidance radar.



*Simpson* and Algerian frigate *El Kirch*, June 2006, after removal of missile launcher.

Capt. Gerald F. DeConto, *Simpson*'s commanding officer from September 1998 to April 2000, was killed at the Pentagon during the September 11, 2001 attacks.\*[13]

In July 2002, *Simpson* responded to Malpelo Island to medevac a wounded Colombian Marine who had received three gunshot wounds.\*[14]

*Simpson* deployed with Helicopter Antisubmarine Squadron (Light) (HSL) 44, Det. 10 as part of NATO's Standing Naval Forces Atlantic on 22 September 2004 returning 20 December 2004. *Simpson* visited New York City 12 October 2004 during this deployment.\*[15] *Simpson*'s Mk 13 missile launcher was removed sometime in 2005 prior to her next deployment.

On 3 January 2006, *Simpson* deployed with HSL-42, Det. 9, joining Standing NRF Maritime Group 1 and participated in a number of international naval exercises in the North Sea, Norwegian Sea and Eastern Mediterranean Sea returning to Mayport 24 June 2006.\*[16]

On 5 October 2007, *Simpson* deployed with HSL-46, Det. 7 and U.S. Coast Guard Law Enforcement Detachment (LEDET) 405, to the eastern Pacific for counter narcotics operations returning April 2008. During the deployment *Simpson* captured 16 metric tons of cocaine. On 29 November 2007, *Simpson* interdicted a self-propelled semi-submersible (SPSS) capable of carrying 5–8 metric tons of cocaine. The sub was sunk by its crew, but the crew was captured and turned over to Colombia.\*[17]\*[18]

## 2010s

On 17 January 2012, *Simpson* deployed to the Sixth Fleet Area of Responsibility, participating in Africa Partnership Station 2012, and Operation Active Endeavor. Ports of call included Funchal, Rota, Casablanca, Dakar, Lagos, Accra, Mindelo, Souda Bay, Sicily, Naples and Praia. She returned to Naval Station Mayport on 17 July 2012.

On 18 September 2013, *Simpson* deployed once more to the United States Sixth Fleet Area of Responsibility. Ports of call included Ponta Delgada, Sicily, Bari, Athens, Valletta, Souda Bay and Casablanca. She returned to Naval Station Mayport on 20 March 2014. *Simpson*'s final homeport was Naval Station Mayport, Florida, with assignment to Destroyer Squadron 14.\*[17]\*[19] *Simpson* was part of the Active Naval Reserve Force, Category A from 2002 until her decommissioning in September 2015.\*[20] She was the final *Oliver Hazard Perry*-class frigate in service in the United States Fleet.\*[21]\*[22] The ship is set to be put up for foreign military sale.\*[23] When *Simpson* was decommissioned, it meant the last United States ship still in active service to have sunk an enemy vessel was the 217-year-old *USS Constitution*.\*[24]

## 2.46.2 See also

- List of ship launches in 1984
- List of ship commissionings in 1985
- List of United States Navy ships

## 2.46.3 References

- [1] Maritime Quest.
  - [2] NVR lists commissioning as 20 September 1985 while Ships history page lists 21 September 1985. DoD image captions such as Image:USS Simpson (FFG-56) during commissioning.jpg list 9 November 1985 leading some websites to use that date for commissioning.
  - [3] BATH IRON STRIKERS TAKING A HARD LINE; John Milne, Globe Staff. Boston Globe. Boston, Mass.: 27 August 1985. pg. 37
  - [4] Commander, Naval Surface Force, Atlantic. Simpson.
  - [5] Evans, Mark L. (1 October 2015). "Simpson II (FFG-56)". Naval History and Heritage Command. Retrieved 8 January 2016.
  - [6] Captain and Massachusetts Man Die in Persian Gulf Blast; Mary Curtius, Globe Staff and Tina Cassidy, Contributing Reporter. Boston Globe. Boston, Mass.: 23 February 1990. pg. 2
  - [7] NTSB. Safety Recommendation M-92-22 through -24. 29 April 1992.
  - [8] U.S. CARRIER STIRS TENSION IN GULF; MARK THOMPSON – Knight-Ridder News Service. The Oregonian. Portland, Or.: 14 March 1992. pg. A.10
  - [9] BUSH WITHDRAWS FORCES, CITING IRAQI COMPLIANCE; Stewart M. Powell Hearst News Service. Seattle Post – Intelligencer. Seattle, Wash.: 1 April 1992. pg. a.2
  - [10] Navysite.de FFG-56. History.
  - [11] NORFOLK-BASED CARRIER HEADING TO SOMALI COAST. Richmond Times – Dispatch. Richmond, Va.: 28 October 1993. pg. B-4
  - [12] U.S. Patrol Craft to Tighten Haiti Embargo; Shallow-Draft Vessels Will Try to Intercept Coastal Traffic; Risk to Navy Personnel Rises. Thomas W. Lippman. The Washington Post (pre-1997 Fulltext). Washington, D.C.: 27 May 1994. pg. a.31
  - [13] Mayport Mirror. Ensign Rebecca L. Rebarich. Honoring Fallen Sailor, Former Simpson CO. 28 October 2004.
  - [14] US Navy. Simpson Rescues Wounded Colombian Marine. 29 July 2002.
  - [15] US Navy. USS Simpson Returns From Deployment. 16 December 2004.
  - [16] Mayport Mirror. USS Simpson Is Back In Town. 29 June 2006.
  - [17] Mayport Mirror. USS Simpson, HSL-46 Detachment 7 Are Back. 9 April 2008.
  - [18] [http://www.navy.mil/search/display.asp?story\\_id=36243](http://www.navy.mil/search/display.asp?story_id=36243) USS Simpson Completes Successful Counter-narcotics Deployment
  - [19] "DesRon 14" . U.S. Navy. Retrieved 6 March 2008.
  - [20] United States Navy Naval Vessel Register. FFG-56.
  - [21] <http://www.navytimes.com/story/military/2015/09/18/crews-past-and-present-bid-farewell-frigate-kauffman/72409454/>
  - [22] "Hours before decommissioning, USS Simpson crew recall historic naval battle" . CNN. Retrieved 29 September 2015.
  - [23] <http://news.usni.org/2015/09/29/last-oliver-hazard-perry-frigate-uss-simpson-leaves-service-marked-for-for>
  - [24] "The Only Ship Left in the US Navy That Has Sunk an Enemy Ship is 217 Years Old" . foxnews.com. Retrieved 20 October 2015.
- This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here. This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here.*

## 2.46.4 External links

- USS *Simpson* official website
- Photo gallery of USS *Simpson* (FFG-56) at NavSource Naval History
- navysite.de: USS *Simpson* – History section appears to duplicate old versions of the official *Simpson* web site Pre-1998 history 1998–1999 history 2000 history

- History of the Frigate
- Maritime Quest – *Simpson*

## 2.47 USS Reuben James (FFG-57)

For other ships of the same name, see *USS Reuben James*.

**USS Reuben James (FFG-57)**, an *Oliver Hazard Perry*-class guided missile frigate, was the third ship of the U.S. Navy named for Reuben James, a boatswain's mate who distinguished himself fighting the Barbary pirates. Her crew totaled 201 enlisted, 18 chief petty officers, and 26 officers.\*[1]

### 2.47.1 Ship history

#### 1980s

The contract to build *Reuben James* was awarded on 22 March 1982 to Todd Pacific Shipyards, Los Angeles Division, San Pedro, California. Her keel was laid on 19 November 1983, and she was launched on 8 February 1985; sponsored by Lois Haight Herrington, wife of Assistant Secretary of the Navy (Manpower and Reserve Affairs) John S. Herrington. She was delivered to the Navy on 3 March 1986, and commissioned on 22 March. She was faster than 30 knots (30 mph; 60 km/h) and powered by two gas turbine engines. Armed with anti-air and anti-ship missiles, an automated three-inch (76 mm) gun, an anti-missile defense system, and two SH-60 *Seahawk* anti-submarine helicopters, *Reuben James* was tasked with hunting submarines as well as battle group escort and maritime interception. *Reuben James* joined the Red Stallions of Destroyer Squadron Thirty-One in June 1987.

Assigned to Mideast Force on her maiden deployment, *Reuben James* participated in twenty-two Operation Earnest Will convoy missions, serving as the convoy commander's flagship on ten of those missions.

#### 1990s

On 10 September 1990 *Reuben James* visited Vladivostok in the Soviet Union\* [2]

In August 1991, *Reuben James* moved from Long Beach, California, to Pearl Harbor, Hawaii. On 1 October 1998, she joined the "Ke Koa O Ke Kai", Destroyer Squadron Thirty-One.

On a WestPac deployment in 1995–96, the ship's rudder fell off. The ship docked in Bahrain for repairs.

#### 2000s

*Reuben James* participated in the CARAT 2000 exercises, including phases in the Philippines, Thailand, Indonesia, Brunei, Malaysia, and Singapore. The first phase of CARAT began in the Philippines on 14 June and the final phase, conducted in Singapore, ended on 22 September. CARAT 2000 demonstrated U.S. commitment to security and stability in Southeast Asia while increasing the operational readiness and capabilities of U.S. forces. The exercise also promoted interoperability and cooperation with U.S. regional friends and allies by offering a broad spectrum of mutually beneficial training opportunities.

In Malaysia, CARAT 2000 encompassed two weeks of extensive training to promote interoperability between U.S. naval forces and the Royal Malaysian Navy and Army. The Strait of Malacca was the setting for several exercises. These included anti-submarine warfare, anti-air warfare, and gunnery exercises. One of the exercises was a semi-final battle problem, or night encounter exercise. The two navies' task groups steamed together in formation for more than 25 hours. The Malaysian-U.S. naval task group was divided into two opposing forces. The Blue Forces consisted of *Reuben James*, *Germantown*, *Mount Vernon*, and the Malaysian ships KD *Sri Indera Sakti* and KD *Lekir*. The Blue Forces were supported by U.S. helicopters from Helicopter Anti-Submarine Squadron (Light) HSL-37, Detachment Four, from Hawaii. The Orange Forces consisted of the frigate *Sides*, the Malaysian ships KD *Perkasa*, KD *Laksamana Tun Abdul Jamil*, and a U.S. Navy P-3C Orion aircraft. *Columbus*, homeported in Pearl Harbor, Hawaii, and *Helena*, homeported in San Diego, also joined the task group in individual phases.\*[3]

For nine months from 2 August 2002, to 27 April 2003, *Reuben James* deployed to the Persian Gulf and participated in Operation Enduring Freedom and Operation Iraqi Freedom\* [4] as part of Cruiser-Destroyer Group Three, the *Abraham Lincoln* Battle Group. After serving approximately six months in theater, *Reuben James* started to make its way back to Pearl Harbor. On New Year's Day 2003, while in port in Brisbane, Australia, the ship was ordered to turn around and go back to the Persian Gulf\* [5] and the deployment was extended indefinitely.\* [6] Finally, after an extended deployment of almost nine months, the *Abraham Lincoln* Battle Group was relieved by *USS Nimitz*.\* [7] This deployment was extremely long, breaking a number of records,\* [8] including the longest deployment ever for a nuclear-powered aircraft carrier.\* [5]

In July 2003, *Reuben James* hosted the Japanese Hatakaze-class destroyer *Shimakaze* for exercises in Pearl Harbor.\* [9] On 23 October 2003 the crew of *Reuben James* dressed ship and manned the rails to render honors to President George W. Bush as he toured Pearl Harbor and visited the *USS Arizona* Memorial.\* [10]

From February to April 2004, she deployed to the Eastern Pacific with an embarked Coast Guard Law Enforcement Detachment in support of counter-narcotics operations.\*[11]\*[12]

Between July and December 2004, *Reuben James* went through an extensive modernization and maintenance program.\*[13] In October 2004, *Reuben James* participated in PASSEX exercises with the *Prairial* (F731).

As part of Expeditionary Strike Group 3 (ESG 3), *Reuben James* deployed on 15 February 2006 on a WESTPAC mission to the Persian Gulf in support of Operation Iraqi Freedom and Operation Enduring Freedom.\*[14] The strike group also consisted of Amphibious Squadron (COMPHIBRON) 3, the 11th Marine Expeditionary Unit (Special Operations Capable), USS *Peleliu*, the guided-missile cruiser *Port Royal*, the guided-missile destroyer *Gonzalez*, the amphibious transport dock *Ogden*, the dock landing ship *Germantown*, Tactical Air Control Squadron(TACRON) 11, and the “Black Jacks” of Helicopter Sea Combat Squadron (HSC) 21.\*[15]

En route to the Persian Gulf, *Reuben James* stopped in New Caledonia.\*[16] The strike group relieved USS *Tarawa* on station in early April 2006 and began its mission of conducting maritime security operations. During operations, *Reuben James* performed services such as providing medical assistance to Sri Lankan fishermen\*[17] and rescuing Kenyan sailors.\*[18] Expeditionary Strike Group 3 was relieved on 9 July 2006 and *Reuben James* returned to Pearl Harbor in August 2006.

*Reuben James* participated in a Passing Exercises (PASSEX) with the Philippine Navy frigate BRP *Gregorio del Pilar* (PF-15) off the coast of Hawaii on 30 July 2011.\*[19]

The frigate completed her final deployment on 3 May 2013. During the final cruise, the ship visited Japan, Brunei and the Philippines in support of theatre security operations and CARAT 2012. *Reuben James* was also awarded the USCG Meritorious Unit Citation for fisheries patrols in the economic exclusion zones of Micronesia, Marshall Islands and Nauru. *Reuben James* is scheduled to be decommissioned during the northern summer of 2013.\*[20]

She was decommissioned on 18 July 2013.\*[21]

## 2.47.2 Cultural references

*Reuben James* played a significant role in Tom Clancy's 1986 novel *Red Storm Rising*. She appeared in the 1990 movie, *The Hunt for Red October* (although her appearance in the film was anachronistic, since she was commissioned about a year after the events in the film). In some scenes, *Reuben James* was portrayed in the film by another *Oliver Hazard Perry* frigate — *Wadsworth* (now ORP *General Tadeusz Kościuszko*).\*[22] The ship was later featured prominently in the 2010 novel by Don

Brown entitled *Malacca Conspiracy*.\*[23]

## 2.47.3 See also

- List of frigates of the United States Navy
- *Abraham Lincoln* Battle Group
- Current United States Navy ships

## 2.47.4 References

- [1] “Ship's History”. [reuben-james.navy.mil](http://reuben-james.navy.mil). Archived from the original on 5 February 2007. Retrieved 21 February 2007.
- [2] “Still Asset Details for DNSC9102252”. [DefenseLink](http://DefenseLink). Retrieved 22 April 2007.
- [3] “Destroyer Squadron Nine”. [globalsecurity.org](http://globalsecurity.org).
- [4] “Home From the War: *Paul Hamilton*, *Reuben James*, *Cheyenne*, VP-47, HSL-37 Return”. [news.navy.mil](http://news.navy.mil).
- [5] “First Hawai'i troops heading home from war”. [honoluluadvertiser.com](http://honoluluadvertiser.com). Retrieved 21 February 2007.
- [6] “Pearl warships to join carrier groups in Gulf”. [honoluluadvertiser.com](http://honoluluadvertiser.com). Retrieved 21 February 2007.
- [7] “Last Pearl ship returns from Iraq duty”. [honoluluadvertiser.com](http://honoluluadvertiser.com). Retrieved 21 February 2007.
- [8] “Ships Returning to Pearl Harbor”. [CommanderNavyRegionHawaii](http://CommanderNavyRegionHawaii). Archived from the original on 26 March 2007. Retrieved 21 February 2007.
- [9] “*Reuben James* Crew Says ‘Sayonara’ to Friends”. [news.navy.mil](http://news.navy.mil). Retrieved 21 February 2007.
- [10] “Bush greets vets, pupils in whirlwind O'ahu visit”. [honoluluadvertiser.com](http://honoluluadvertiser.com). Retrieved 21 February 2007.
- [11] “*Reuben James* Heads to Central America”. [news.navy.mil](http://news.navy.mil). Retrieved 21 February 2007.
- [12] “*Reuben James* Returns to Pearl Harbor”. [news.navy.mil](http://news.navy.mil). Retrieved 21 February 2007.
- [13] “*Reuben James* Sails with Pride After Successful INSURV”. [news.navy.mil](http://news.navy.mil). Retrieved 21 February 2007.
- [14] “Peleliu ESG WESTPAC 06 Deployment”. [globalsecurity.org](http://globalsecurity.org). Retrieved 25 February 2007.
- [15] “ESG 3 Deploys in Support of Global War on Terrorism”. [news.navy.mil](http://news.navy.mil). Retrieved 25 February 2007.
- [16] “USS *Reuben James* Visits New Caledonia”. [news.navy.mil](http://news.navy.mil). Retrieved 25 February 2007.
- [17] “USS *Reuben James* Assists Fisherman in Arabian Sea”. [news.navy.mil](http://news.navy.mil). Retrieved 25 February 2007.
- [18] “USS *Reuben James* Rescues Kenyan Sailors”. [news.navy.mil](http://news.navy.mil). Retrieved 25 February 2007.

- [19] “Newest Philippine Navy Ship Gets Aloha Welcome” . MENAFN.com. MENAFN.com. 28 July 2011. Retrieved 31 July 2011.
- [20] Dickerson, Travis. “USS Reuben James Makes Final Return to Hawaii” . United States Navy. Retrieved 6 July 2013.
- [21] <http://navylive.dodlive.mil/2013/07/18/uss-reuben-james-decommissioning-ceremony/>
- [22] “History” . USS Wadsworth.org. Retrieved 14 December 2011.
- [23] “Author Donates Autographed Books to *Reuben James* Sailors” . hookelenews.com. Retrieved 8 July 2011.

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found [here](#).*

## 2.47.5 External links

- [USS \*Reuben James\* official website](#)
- [Photo gallery of USS \*Reuben James\* \(FFG-57\) at NavSource Naval History](#)
- [navysite.de: USS \*Reuben James\*](#)
- [MaritimeQuest USS \*Reuben James\* \(FFG-57\) pages](#)
- [CARAT at GlobalSecurity.org](#)
- [USS \*Reuben James\* at WikiMapia](#)
- [Crew List at navysite.de](#)
- [WWE Divas Tour Pearl Harbor](#)
- [Helicopter Squadron Light 37 official website](#)

## 2.48 USS Samuel B. Roberts (FFG-58)

For other ships of the same name, see [USS Samuel B. Roberts](#).

**USS *Samuel B. Roberts* (FFG-58)** is one of the final ships in the United States Navy's *Oliver Hazard Perry*-class of guided missile frigates (FFG). Commissioned in 1986, the ship was severely damaged by an Iranian mine in 1988, leading U.S. forces to respond with Operation Praying Mantis. Repaired and returned to duty, the ship served until decommissioned in 2015.

### 2.48.1 Commissioning and namesake

The frigate was named for [Samuel B. Roberts](#), a Navy coxswain who was killed while evacuating the U.S. Marines during the battle of Guadalcanal in 1942. Roberts was posthumously awarded the Navy Cross.

*Samuel B. Roberts* was the third U.S. ship to bear the coxswain's name, after *Samuel B. Roberts* (DE-413), a *John C. Butler*-class destroyer escort, commissioned in 1944 and sunk in the Battle off Samar later that year; and *Samuel B. Roberts* (DD-823), a *Gearing*-class destroyer, commissioned in 1946 and struck in 1970.

*Samuel B. Roberts* was launched in December 1984 by Bath Iron Works, Bath, Maine and sponsored by the wife of Jack Yusen, a member of DE-413's crew. The frigate was put in commission in April 1986 under the command of Commander Paul X. Rinn.

### 2.48.2 1988 deployment and mine strike

*Samuel B. Roberts* deployed from her home port in Newport, Rhode Island, in January 1988, heading for the Persian Gulf to participate in Operation Earnest Will, the escort of reflagged Kuwaiti tankers during the Iran–Iraq War. *Samuel B. Roberts* had arrived in the Persian Gulf and was heading for a refueling rendezvous with *San Jose* on 14 April when the ship struck an M-08 naval mine in the central Persian Gulf, an area she had safely transited a few days earlier. The mine blew a 15 feet (4.6 m) hole in the hull, flooded the engine room, and knocked the two gas turbines from their mounts. The blast also broke the keel of the ship; such structural damage is almost always fatal to most vessels. The crew fought fire and flooding for five hours and saved the ship. Among other steps, sailors cinched cables on the cracked superstructure in an effort to stabilize it.\*[1] She used her auxiliary thrusters to get out of the mine field at 5 kn (5.8 mph; 9.3 km/h). She never lost combat capability with her radars and Mk13 missile launcher. Ten sailors were medevaced by HC-5 CH-46s embarked on *San Jose* for injuries sustained in the blast; six returned to *Samuel B. Roberts* in a day or so. Four burn victims were sent for treatment to a military hospital in Germany, and eventually to medical facilities in the United States.\*[2]

When U.S. divers recovered several unexploded mines, they found that their serial numbers matched the sequence on mines seized the previous September aboard an Iranian mine-layer named *Iran Ajr*. Four days later, U.S. forces retaliated against Iran in Operation Praying Mantis, a one-day campaign that was the largest American surface engagement since World War II.\*[3] U.S. ships, aircraft, and troops destroyed two Iranian oil platforms allegedly used to control Iranian naval forces in the Persian Gulf, sank one Iranian frigate, damaged another, and sent at least three armed high-speed boats to the bottom. The U.S. lost one Marine helicopter and its crew

of two airmen in what appeared to be a night maneuver accident rather than a result of hostile operations.

### 2.48.3 Repairs

On 27 June 1988, *Samuel B. Roberts* was loaded onto *Mighty Servant 2*, a semi-submersible heavy lift ship owned by Dutch shipping firm *Wijsmuller Transport* and carried back to Newport for \$1.3 million.\* [4] The frigate arrived at BIW's Portland, Maine, yard on 6 October 1988 for repairs. The repair job was unique: the entire engine room was cut out of the hull, and a 315-ton replacement module was jacked up and welded into place.\* [5] She undocked 1 April 1989 for sea trials.

The repairs were completed three weeks ahead of schedule at a cost of \$89.5 million, \$3.5 million less than expected.\* [1] By comparison, *Princeton*, which was damaged by a moored mine during the 1991 Gulf War, was repaired for \$24 million;\* [6] however, the cruiser was not directly struck by the mine and her displacement is nearly twice that of *Samuel B. Roberts*. The mine that nearly sank *Samuel B. Roberts* had an estimated cost of \$1,500.\* [6]

After 13 months of repairs, *Samuel B. Roberts* was returned to service in a 16 October 1989 ceremony.

### 2.48.4 After repair

*Samuel B. Roberts* made her second deployment in 1990 for Operation Desert Storm and Operation Desert Shield. The frigate operated as part of the Red Sea Maritime Interception Force, an international force of ships that enforced U.N. sanctions against Iraq. The frigate's sailors boarded more than 100 merchant ships in efforts to prevent cargo shipments to or from Iraq.\* [7] On 28 March 1991, she returned to Newport.

“*Sammy B*”, as the ship is sometimes called, was later homeported in Mayport, Florida.

On 30 August 1991, Joseph A. Sestak took command of *Samuel B. Roberts*, which was named the Atlantic Fleet's best surface combatant in the 1993 Battenberg Cup competition.

*Samuel B. Roberts* was decommissioned at Mayport on 22 May 2015,\* [8] then towed to the Naval Inactive Ship Maintenance Facility in Philadelphia. The ship is slated to be dismantled.\* [9]

### 2.48.5 Gallery

- MV *Mighty Servant 2* carrying mine-damaged *Samuel B. Roberts* on 31 July 1988
- *Samuel B. Roberts* in a dry dock in Dubai, UAE for temporary repairs.

- *Samuel B. Roberts* damaged hull.

## 2.48.6 References

- [1] Peniston, Bradley (2006). *No Higher Honor: Saving the USS Samuel B. Roberts in the Persian Gulf*. Annapolis: Naval Institute Press. ISBN 1-59114-661-5.
- [2] Liewer, Steve, “Teamwork Saved Stricken Warship”, *San Diego Union-Tribune*, 19 April 2008.
- [3] Love, Robert William. *History of the U.S. Navy*. Harrisburg: Stackpole Books, 1992. ISBN 0-8117-1863-8 p. 787
- [4] “NO HIGHER HONOR: Timeline” . Navybook.com. Retrieved 19 May 2011.
- [5] “NO HIGHER HONOR: Photos: FFG 58 under repair at Bath Iron Works” . Navybook.com. Retrieved 19 May 2011.
- [6] Annati
- [7] "(Pd-Usn)". History.navy.mil. Retrieved 19 May 2011.
- [8] Peniston, Bradley (May 23, 2015). “The Once—and Future?—USS Samuel B. Roberts” . Defense One. Retrieved May 30, 2015.
- [9] “SEAPOWER Magazine Online” . seapower-magazine.org. Retrieved 13 August 2014.

Annati, Massimo *Al diavolo le mine* RID magazine, Coop. Riviera Ligure, Italy, n. 6/2005 This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here. This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here.

## 2.48.7 Further reading

- Peniston, Bradley (2006). *No Higher Honor: Saving the USS Samuel B. Roberts in the Persian Gulf*. Annapolis: Naval Institute Press. ISBN 1-59114-661-5.
- Wise, Harold Lee (2007). *Inside the Danger Zone: The U.S. Military in the Persian Gulf 1987–88*. Annapolis: Naval Institute Press. ISBN 1-59114-970-3.

## 2.48.8 External links

- USS *Samuel B. Roberts* official site
- Photo gallery of USS *Samuel B. Roberts* (FFG-58) at NavSource Naval History
- *Samuel B. Roberts* narrative and timeline

- Photos of *Samuel B. Roberts* during February 1986 sea trials
- Photos of *Samuel B. Roberts* being commissioned in April 1986
- Photos of *Samuel B. Roberts* being hauled from the Persian Gulf to Newport, R.I. aboard *Mighty Servant 2* in 1988
- MaritimeQuest USS Samuel B. Roberts FFG-58 pages

## 2.49 USS Kauffman (FFG-59)

**USS Kauffman (FFG-59)**, an *Oliver Hazard Perry*-class guided missile frigate, was a ship of the United States Navy named for Vice Admiral James L. Kauffman (1887–1963) and his son, Rear Admiral Draper L. Kauffman (1911–1979), both experts in sub-surface naval missions.

*Kauffman* was laid down on 8 April 1985 by the Bath Iron Works, Bath, Maine; launched on 29 March 1986; sponsored by Mrs. Elizabeth Kauffman Bush, the daughter of Vice Admiral James L. Kauffman and sister of Rear Admiral Draper L. Kauffman; and commissioned on 28 February 1987 at Bath, Maine, Commander John C. Dranchak, USN in command.<sup>\*[1]</sup>

As of 2012, *Kauffman* is captained by Commander William K. Shafley, III, USN, homeported at NS Norfolk, Virginia, and assigned to Destroyer Squadron 22.

*Kauffman* deployed for the final time on 8 January 2015. She was decommissioned on 18 September 2015.<sup>\*[2]</sup>

### 2.49.1 History



*USS Kauffman sailing through Souda Bay, Crete, in August 2002.*

Note: the milestones are extracted from the official command histories <sup>\*[3]</sup> and no other sources. The set of command histories available is not complete, resulting in the partial record following.

### 1988 \*[4]

- 6 January – 28 May: 4100 ton modifications by Bath Iron Works in Bath, Maine.
- 12 August: BM3 Kerekgyarto died instantly when the Slewing Arm Davit broke from its mount and fell on him.

### 1989 \*[5]

- 7 April: Commander Ronald C. Bogle, USN relieves Commander John C. (30 knot) Dranchak, USN
- 31 May – 10 November: Maiden deployment, Med 3-89
- 4–7 August: Sevastopol, USSR port visit
- 13 September – 3 October: NATO exercise Display Determination-89

### 1990 \*[6]

- 9 January: presented with Battle 'E'
- 15 January – 15 March: ships restricted availability, #1A gas turbine engine and the Mk. 75 76mm gun mount are replaced
- 8–15 June: BALTOPS-90

### 1991 \*[7]

- 5 April: Commander James H. Chapman Jr., USN relieves Commander Ronald C. Bogle, USN
- 26 April – 26 October: deployment, MEF 2-91
- 4 June – 16 September: Middle East Force (MEF) operations in the Persian Gulf

### 1992 \*[8]

- 6 January – 21 February: counter narcotic operations, Caribbean Sea
  - towed a vessel that had lost propulsion 250 nautical miles (460 km; 290 mi) to Guantanamo Bay, Cuba
  - rescued the crew from the stricken 237 feet (72 m) coastal freighter Ramsli just before she sank
- 2 August – 23 October: Ships Restricted Availability (Drydock), by Bath Iron Works Bath, Maine
- 15 September: presented with Battle 'E'
- 18 December: Commander James F. Deppe, USN relieves Commander James H. Chapman Jr., USN

**1993 \*[9]**

- 11 March – 8 September: deployed, Med 2–93
- 29 April – 18 June: Operation Deny Flight in the Adriatic Sea, Operation Maritime Guard
- 22 June – 17 August: Maritime Interdiction Operations enforcing United Nations sanctions against Iraq, North Red Sea
- 7 November: provided assistance to the Argentine frigate ARA Granville (P-33) while in port at Roosevelt Roads Naval Station, Puerto Rico
- 9 November – 6 December: counter drug operations, Caribbean Sea

**1994 \*[10]**

- 13 May – 3 June: Maritime Interception Operations enforcing United Nations sanctions against Haiti
- 6 June: Homeport shift from Newport, Rhode Island to Norfolk, Virginia
- 1 July – 1 August: Operation Support Democracy, Haiti with 3 US Army OH-58 Kiowa helicopters
- 5–6 July: rescued 787 migrants from Haitian waters, transported to Guantanamo Bay, Cuba
- 20–21 July: towed the Motor Vessel Valerie I from the south coast of Haiti to Guantanamo Bay, Cuba
- 9 September: Commander David F. Britt, USN relieves Commander James F. Deppe, USN

**1996 \*[11]**

- 24 April: completion of an extended ships restricted availability period beginning September 1995, including installation of Mod 6 to the Mk 92 Guided Missile Fire Control System
- 8 July – 24 August: counter drug operations, Caribbean Sea
- 20 September: Commander John A. Kunert, USN relieves Commander David F. Britt, USN
- 10 –31 December: Operation Carib Shield – counter drug operations, Caribbean Sea

**1997 \*[12]**

- 1–17 January: Operation Carib Shield – counter drug operations, Caribbean Sea
- 4 March – 24 June: ships restricted availability (dry-dock) by Norfolk Shipbuilding and Drydock Company

**1998 \*[13]**

- 6 March: Commander George J. Karol II, USN relieves Commander John A. Kunert, USN
- 13 March – 11 September: deployed, Med (originally tasked to Middle East Force)
- 12 October – 11 December: planned restricted availability

**1999 \*[14]**

- 27 August: Commander Rigoberto Sáez-Ortiz, USN relieves Commander George J. Karol, USN
- 15–18 September: sortied for Hurricane Dennis

**2004 \*[15]**

- 15 July – 22 September: ships restricted availability, installed Mk 53 "Nulka" Decoy Launching System (DLS)
- 31 August: Commander Kenneth A. Krogman, USN relieves Commander John P. Gelinne, USN

**2.49.2 Commanding officers**

Note: unless otherwise referenced, information has been sourced from the official command histories.\* [3]

- 28 February 1987\*[16] – 7 April 1989: Commander John C. Dranchak, USN
- 7 April 1989 – 5 April 1991: Commander Ronald C. Bogle, USN
- 5 April 1991 – 18 December 1992: Commander James H. Chapman Jr., USN
- 18 December 1992 – 9 September 1994: Commander James F. Deppe, USN
- 9 September 1994 – 20 September 1996: Commander David F. Britt, USN
- 20 September 1996 – 6 March 1998: Commander John A. Kunert, USN
- 6 March 1998 – 27 August 1999: Commander George J. Karol III, USN
- 27 August 1999 – (unknown): Commander Rigoberto Sáez-Ortiz, USN
- May 2001 (est) – 28 February 2003: Commander Mark Reagan Hagerott\*[17]
- 28 February 2003\*[17] – 31 August 2004: Commander John P. Gelinne, USN

- 31 August 2004 – (unknown), at 30 September 2005:<sup>\*</sup> [18] Commander Kenneth A. Krogman, USN
- at 27 November 2006<sup>\*</sup> [19] and at 12 March 2007: Commander Chris Rhoden, USN<sup>\*</sup> [20]
- at 7 April 2008<sup>\*</sup> [19] and at 16 November 2008<sup>\*</sup> [21] – 8 June 2009:<sup>\*</sup> [19] Commander Robert Cepk
- 8 June 2009 – (unknown) : Commander Dale W. Maxey, USN<sup>\*</sup> [19]
- present: CCmdr. Michael Concannon, USN \* [22]

### 2.49.3 References

- [1] Frey, Courtney; Evans, Mark L. (1 October 2015). "Kauffman (FFG-59)". Naval History and Heritage Command. Retrieved 12 January 2016.
- [2] *USS Kauffman to be Decommissioned*, Story Number: NNS150917-15 from USS *Kauffman* Public Affairs, 17 September 2015.
- [3] "Kauffman (FFG 59)". History.navy.mil. Retrieved 2014-08-01.
- [4] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1988.pdf>
- [5] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1989.pdf>
- [6] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1990.pdf>
- [7] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1991.pdf>
- [8] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1992.pdf>
- [9] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1993.pdf>
- [10] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1994.pdf>
- [11] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1996.pdf>
- [12] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1997.pdf>
- [13] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1998.pdf>
- [14] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/1999.pdf>
- [15] <http://www.history.navy.mil/content/dam/nhhc/research/archives/command-operation-reports/ship-command-operation-reports/k/kauffman-ffg-59-i/2004.pdf>
- [16] "Find Imagery". DefenseImagery.mil. Retrieved 2014-08-01.
- [17] "Notes on Captain Mark Reagan Hagerott". Spongbongo.com. Retrieved 2014-08-01.
- [18] "USS Kauffman, USS Normandy Return From Deployment - DefendAmerica News Article". Defendamerica.mil. Retrieved 2014-08-01.
- [19] "USS Kauffman (FFG 59) history". Uscarriers.net. Retrieved 2014-08-01.
- [20] "Find Imagery". DefenseImagery.mil. Retrieved 2014-08-01.
- [21] Archived 4 October 2009 at the Wayback Machine
- [22] <http://news.yahoo.com/last-deployment-navy-frigates-soon-decommissioned-224836583.html>

*This article includes information collected from the Naval Vessel Register, which, as a U.S. government publication, is in the public domain. The entry can be found here. This article incorporates text from the public domain Dictionary of American Naval Fighting Ships. The entry can be found here.*

### 2.49.4 External links

- [USS \*Kauffman\* official website](#)
- [Photo gallery of USS \*Kauffman\* \(FFG-59\) at NavSource Naval History](#)
- [navysite.de: USS \*Kauffman\*](#)
- [MaritimeQuest USS Kauffman FFG-59 pages](#)

## 2.50 USS Rodney M. Davis (FFG-60)

For other ships of the same name, see [USS Davis](#).

**USS Rodney M. Davis (FFG-60)** is an *Oliver Hazard Perry*-class guided missile frigate of the United States Navy named for Marine Sergeant Rodney M. Davis (1942–1967), who was posthumously awarded the Medal of Honor for his heroism in the Vietnam War.

*Rodney M. Davis* was laid down on 8 February 1985 by the Todd Pacific Shipyards, Los Angeles Division, San Pedro, California; launched on 11 January 1986; Mrs. Judy P. Davis (Sgt. Davis' wife); and commissioned on 9 May 1987, Cmdr. Craig R. Heckert in command.<sup>\*[1]</sup>

The ship was homeported at Yokosuka, Japan for several years while assigned to Destroyer Squadron 15. As of 2005, *Rodney M. Davis* is homeported at NS Everett, Washington, and assigned to Destroyer Squadron 9. *Rodney M. Davis* decommissioned at NS Everett, Washington on January 23, 2015.

### 2.50.1 History

On 28 April 2001 a US Coast Guard Law Enforcement Detachment (LEDET) assigned to *Rodney M. Davis*, with later assistance from the *USCGC Active* (based in Port Angeles, WA) made the largest cocaine seizure in maritime history when they boarded and seized the Belizean F/V *Svesda Maru* 1,500 miles (2,400 km) south of San Diego. The fishing vessel was carrying 26,931 pounds (12,216 kg) of cocaine.

In the summer of 2005, *Rodney M. Davis* participated in the 11th annual Cooperation Afloat Readiness and Training (CARAT) exercise. CARAT is an annual series of bilateral military training exercises designed to enhance cooperative working partnerships with several Southeast Asian nations. Ensuring freedom of the seas by increasing maritime security efforts in the region is a primary focus of the CARAT series.

In the summer of 2006, with the help of the crew from *Rodney M. Davis*, 11 tons of creosote logs were removed from the beaches of NAVMAG, Indian Island. The project was completed with no labor cost, due to the support of *Rodney M. Davis* crew on this shoreline enhancement project. Removal of creosote contaminant source from the beaches enhances shoreline habitat and marine water quality.

### 2.50.2 2006–2007 Deployment

*Rodney M. Davis* departed Naval Station (NAVSTA) Everett for a deployment to the Southern Pacific, 28 November 2006.

On 3 March 2007, Sailors from *Rodney M. Davis* participated in two community relations (COMREL) projects during the ship's visit to Panama City, Panama in February. The *Rodney M. Davis* Sailors' COMREL efforts included visits to local orphanages and maintenance/improvements at a library in the Cinco de Mayo district of the city. Sailors spent their day cleaning, re-pairing, and painting chairs and cabinets at the Eusebio Morales Library. Five more *Rodney M. Davis* sailors visited a local orphanage, Hogar Divino Nino, to spend time with infants and toddler orphans to give them some much needed human contact. *Rodney M. Davis* sailors took diapers, formula, baby wipes and other child care supplies to aid the staff at the orphanage. The two groups reassembled at another orphanage, Nutre Hogar, to hand out Spanish-language Disney movies to the children, which were part of a generous donation made through the Jacksonville, Florida, area office of the [United Service Organizations \(USO\)](#).

*Rodney M. Davis* completed her transit of the Panama Canal on 25 March 2007 from the Caribbean Sea to the Pacific Ocean.

The Sailors of *Rodney M. Davis* completed their third community relations (COMEL) project in Panama City, Panama on 3 April 2007. During the ship's three-day port visit, 21 members of the crew spent a day helping to improve Hogar Nuevo Pacto, a home for abused children in Panama City. The crew raised \$1,100 in donations to pay for supplies and improvements for the home. *Rodney M. Davis* sailors bought equipment to repaint the inside of the house, as well as groceries, new shower curtains, bed sheets, and light fixtures for the children's living areas. The home, previously U.S. military housing, was greatly in need of some modernization and assistance from able hands. Despite rainy weather outside, the crew spent the day productively inside, painting hallways and bedrooms, installing conveniences like toilet paper dispensers and toothbrush holders in the bathrooms, and replacing lights and correcting electrical safety problems.

On the evening of 19 April 2007, *Rodney M. Davis* intercepted the fishing vessel *Mariana de Jesus* in international waters. The 33-foot vessel was overcrowded with 31 migrants. *Rodney M. Davis* gave the migrants food and water and they were all examined by the ship's medical personnel. Some were treated for mild dehydration and headaches, but overall they were found to be in good physical condition. The migrants were then transferred to the El Salvadoran Navy.

On 23 April 2007, the Costa Rican Coast Guard vessel *Juan Rafael Mora* and *Rodney M. Davis* intercepted the fishing vessel *Kuerubin* with 61 Chinese migrants, all of whom were transferred to *Juan Rafael Mora*. *Rodney M. Davis* was tasked to ensure their health and safety was maintained by providing food, water, and medical supplies. All were malnourished and dehydrated for they had been without food or water for four days.

The frigate returned to Everett naval base on 12 June 2007 after a six-month deployment in the war on drugs.

The first maritime seizure of liquid cocaine occurred 25 April when the *Rodney M. Davis* located the fishing vessel *Emperador* from Ecuador in the Eastern Pacific. A Coast Guard Law Enforcement Detachment (LEDET) boarded *Emperador* and located 3,850 gallons of liquid cocaine. Each gallon of the liquid is the equivalent of 1.3 kilograms of processed cocaine. The Coast Guard boarding team detained the 17 crewmembers of the vessel. Sixteen of the crewmembers were from Ecuador, and one of the crewmembers was Colombian. The Coast Guard boarding team and crew of *Rodney M. Davis* transported the vessel to Guayaquil, Ecuador, for further examination by officials from the Drug Enforcement Administration and Ecuadorian authorities. The majority of the liquid cocaine, 3,600 gallons, was turned over to Ecuadorian authorities for destruction.\* [2] *Rodney M. Davis* was again underway in late spring, 2008. In the course of conducting workups for a fall deployment, *Rodney M. Davis* was ordered to participate in RIMPAC 2008 off Hawaii. While docked in Pearl Harbor prior to the exercise, an unusual helicopter detachment embarked *Rodney M. Davis*. For the first time in 10 years, *Kitty Hawk* was in Hawaii. She had been the Navy's only forward deployed aircraft carrier until that spring, and she was on her way to San Diego to crossdeck Carrier Air Wing Five to *George Washington* prior to her decommissioning. Onboard *Kitty Hawk* was a detachment from HS-14 out of NAF Atsugi, Japan. The detachment went underway with RMD for the entire exercise, providing a force multiplying ASW capability to a ship that was soon surrounded by "enemy" submarines during the exercise. The RMD/HS-14 Team performed very well, easily allowing her to claim the title of "most deadly" ASW ship in the exercise task group.

### 2.50.3 2008–2009 Deployment



*USS Rodney M. Davis after the removal of her foredeck Mk 13 missile launcher, 13 July 2008.*

While on patrol in the Eastern Pacific Ocean, units assigned to the U.S. Navy's 4th Fleet and the U.S. Coast

Guard intercepted a fishing vessel carrying more than 4 metric tons of cocaine, 5 December. The combined team of *Rodney M. Davis* (FFG 60), with embarked Helicopter Anti-Submarine Squadron Light (HSL-43) Det. 2, and U.S. Coast Guard Law Enforcement Detachment (LEDET) 106 intercepted the fishing vessel in an early morning interdiction, capturing nine suspected narcotics smugglers and the large cargo of cocaine with an estimated import value of \$90 million. A search of the vessel revealed the large amount of cocaine. The narcotics were seized under the authority the Coast Guard LEDET. The coordinated actions of the U.S. Navy, U.S. Coast Guard and Joint Interagency Task Force South were instrumental to the successful interdiction of narcotics.

*Rodney M. Davis*, homeported in Everett, Wash., returned from its 6-month CNT deployment on 21 April 2009 during which it was operating in Latin America under the operational control of U.S. Naval Forces Southern Command (NAVSO) and U.S. 4th Fleet, conducting counter illicit trafficking operations in support of JIATF-South, U.S. law enforcement and U.S. and participating nations' drug control policy.

*Rodney M. Davis* is also supporting the U.S. Maritime Strategy by conducting theater security cooperation (TSC) events in the Caribbean and Latin America. TSC encompasses a robust strategy that includes military-to-military exchanges, multi-national exercises and training, diplomatic port visits, community relations activities and Project Handclasp distributions.\* [3]

### 2.50.4 2010 Deployment

On 23 September 2010 while operating as part of the 4th Fleet, *Rodney M. Davis* captured a 46-foot fishing vessel that flew Ecuadorian colours. Aboard the Ecuadorian vessel the *Rodney M. Davis*'s US Coast Guard Law enforcement detachment seized 1,562.5 kilos of cocaine in 62.5 bails.\* [4]

### 2.50.5 2014 Deployment and Decommissioning

The ship left Everett June 12 to join 48 ships from 22 countries for Rim of the Pacific (RIMPAC) 2014. Following RIMPAC, a U.S. Coast Guard Law Enforcement Team embarked the ship and performed compliant boarding operations and visit, board, search and seizures training with Sailors on board.

Subsequently, the ship conducted extensive theater security cooperation in the United States Seventh Fleet area of responsibility. A detachment from HSM-51 embarked with the crew to provide reconnaissance and aerial support for the ship's 7th Fleet operations.

The ship visited ports including Yokosuka, Japan; Sembawang, Singapore; the Republic of the Maldives;

Indonesia and Brunei. As the first U.S. Navy vessel to visit the Republic of the Maldives in four years, Rodney M. Davis hosted the Maldives National Defense Force Chief of Defense, conducted boarding exercises with the Maldivian Coast Guard, and performed community service at a local orphanage.

During the ship's visit to Medan, Indonesia, the ship hosted Ray Mabus, the Secretary of the Navy, and *Rodney M. Davis*'s sailors took part in cultural exchanges with more than 800 students at Medan universities and high schools.

While in Brunei, the ship conducted training events with the Royal Brunei Armed Forces as a part of Cooperation Afloat Readiness and Training (CARAT) 2014. Activities included training symposia and shipboard damage control training ashore, and cross-deck landings, medical evacuation drills and maneuvering exercises at sea. Visit, board, search and seizure teams from *Rodney M. Davis* and the Royal Brunei Navy Darussalam class offshore patrol vessel KDB *Darulaman* (P-08) conducted compliant boarding exercises with their partner nation's ship.<sup>\*[5]</sup>

During the six-month deployment, the ship and crew of more than 200 Sailors, based at Naval Station Everett and assigned to Destroyer Squadron (DESRON) 9, conducted presence operations and theater security cooperation with partner nations in the Indo-Asia-Pacific region. In total, the ship and its crew transited more than 37,000 nautical miles, conducted 13 underway replenishment and performed nearly 300 hours of flight operations at sea.<sup>\*[6]</sup>

*Rodney M. Davis* was decommissioned on 23 January 2015 at Naval Station Everett and is scheduled to be transferred for dismantlement on 31 March.<sup>\*[7]</sup>

The documentary titled "The Last Frigate" follows the crew during the deployment and decommissioning of the ship.<sup>\*[8]</sup>

## 2.50.6 References

- [1] Evans, Mark L. (8 July 2015). "Rodney M. Davis (FFG-60)". Naval History and Heritage Command. Retrieved 12 January 2016.
- [2] COAST GUARD, NAVY TO OFFLOAD 9,000 POUNDS OF COCAINE; 250 GALLONS OF LIQUID COCAINE
- [3] USS Rodney M. Davis Intercepts 4.5 Metric Tons of Cocaine
- [4] <http://www.globalsecurity.org/military/library/news/2010/10/mil-101007-nns01.htm>
- [5] [http://www.navy.mil/submit/display.asp?story\\_id=84351](http://www.navy.mil/submit/display.asp?story_id=84351)
- [6] [http://www.navy.mil/submit/display.asp?story\\_id=84992](http://www.navy.mil/submit/display.asp?story_id=84992)

[7] [http://www.navy.mil/submit/display.asp?story\\_id=85327](http://www.navy.mil/submit/display.asp?story_id=85327)

[8] *The Last Frigate*, retrieved 2015-06-24

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## 2.50.7 External links

- [USS Rodney M. Davis official website](#)
- [Photo gallery of USS Rodney M. Davis \(FFG-60\) at NavSource Naval History](#)
- [navysite.de: USS Rodney M. Davis](#)
- [MaritimeQuest USS Rodney M. Davis FFG-60 pages](#)

## 2.51 USS Ingraham (FFG-61)

For other ships of the same name, see [USS Ingraham](#).

**USS Ingraham (FFG-61)**, the last American *Oliver Hazard Perry*-class guided missile frigate to be built, was the fourth ship of the United States Navy to be named for Captain Duncan Ingraham (1802–1891).

### 2.51.1 Built in Los Angeles, California

*Ingraham* was laid down on 30 March 1987 at the Todd Pacific Shipyards, Los Angeles Division, San Pedro, California. She was launched on 25 June 1988; sponsored by Mrs. Linda E. Carlson, wife of Vice Admiral Dudley L. Carlson, Chief of Naval Personnel; and commissioned on 5 August 1989, Commander Charles S. Vogan Jr., in command. *Ingraham* was decommissioned on 30 January 2015.<sup>\*[1]</sup>

Prior to decommissioning, *Ingraham* was commanded by Commander Dan Straub, USN. *Ingraham*'s former homeport is at NS Everett, Washington, and was assigned to Destroyer Squadron 9.<sup>\*[2]\*[3]</sup>

### 2.51.2 Service History

#### Operation Fiery Vigil

Mount Pinatubo, a volcano located on Luzon in the Philippines, erupted on 12 June 1991. The mountain's fury blackened the skies across Angeles City and much

of Luzon for nearly 36 hours. Typhoon Yunya added to the devastation when it slammed inland with fierce winds and rain. The rain eventually cleared the atmosphere of most of the choking and blinding ash, but the disaster deposited a heavy eight-inch coating of grey ash over much of the area around Naval Station (NS) Subic Bay and Naval Air Station (NAS) Cubi Point. Sailors observed that the residue gave the landscape the appearance of dry cement. The ash crushed many lightweight structures, and a chalky film covered the bay, which presented the appearance of a translucent shade of green. The disaster cut electricity and water to the base for two days, and only heavy trucks could grind their way through the morass to reach victims. Rescue workers also contended with earthquake aftershocks. The volcanic eruption and the typhoon killed more than 300 people and displaced more than 300,000 victims.\*[1]

Aircraft carriers *Abraham Lincoln* and *Midway*, together with *Ingraham* and ships from Amphibious Readiness Group Alpha, led by amphibious assault ship *Peleliu*, participated in Operation Fiery Vigil, the evacuation of those displaced by the disaster. *Abraham Lincoln* transported 4,323 people, primarily USN and USAF dependents, from Subic Bay, Cubi Point, and Clark Air Base to Cebu City, Cebu, for further evacuation to Guam and the continental U.S.\*[1]

*Abraham Lincoln* sailed more than 1,800 nautical miles (2,100 mi; 3,300 km) through inshore waters during Fiery Vigil. This voyage required careful attention to detail from her Navigation Department because of the myriad of other vessels, treacherous shoals, and currents. The carrier also supported *Lake Champlain* while the guided missile cruiser evacuated a further 844 people and their pets during three trips in and out of the disaster area. *Lake Champlain*'s historian noted that the devastation and the suffering of the victims "overwhelmed" her crewmen. Additional squadrons that assisted humanitarian efforts included Strike Fighter Squadron (VFA) 94, Composite Squadron (VC) 5, and Helicopter Anti-Submarine Squadron Light (HSL) 47.\*[1]

Thousands of Filipino looters magnified the tragedy when they climbed over the gates and ransacked abandoned homes. The mob overwhelmed military policemen by sheer numbers and determination. In many instances, the looters wiped out treasured mementoes of families.\*[1]

### January 2008 Iranian incident

Sailors on board guided missile destroyer *Hopper* reported seeing IT2 Menelek Brown of the ships company at 0430 on 3 January 2008, but Menelek failed to muster at 0730 that morning, while the ship was carrying out maritime security operations in the Arabian Sea. Crewmembers unsuccessfully searched the destroyer for their shipmate, and *Hopper* sounded "man overboard." At 1505 the ship commenced a coordinated search of the



*Small craft suspected to be from the Iranian Revolutionary Guard Navy (IRGCN), maneuvers in close proximity of Ingraham.*

surrounding area with guided missile cruiser *Port Royal* and *Ingraham*. A Lockheed P-3C Orion assisted the ships as they conducted an "expanding square" search from the position 18°26'21"N 63°53'35"E / 18.43917°N 63.89306°E, but they ended their search the following day without finding Brown.\*[1]

On 6 January 2008, *Hopper*, *Port Royal*, and *Ingraham* were entering the Persian Gulf through the Strait of Hormuz when five Iranian motor boats approached them at high speed and in a reportedly threatening manner. The American ships had been in the Arabian Sea searching for a sailor who had been missing for one day. The U.S. Navy reported that the Iranian boats made "threatening" moves toward the U.S. vessels, coming as close as 200 yards (180 m). The U.S. Navy ships received a radio transmission saying, "I am coming to you. You will explode after few minutes." While the American ships prepared to open fire, the Iranians abruptly turned away, the U.S. Navy officials said. Before leaving, the Iranians dropped white boxes into the water in front of the American ships. The American ships did not investigate the boxes. Officials from the two countries differed on their assessments of the severity of the incident. The Iranians claimed that they were conducting normal maneuvers, whereas American officials claimed that an imminent danger to American naval vessels existed.\*[4]

### September 2009 Samoa earthquake and tsunami

On 29 September 2009, *Ingraham* was en route to American Samoa and was the first U.S. military asset to arrive and assist in the recovery efforts following the earthquake and tsunami.\*[5]\*[6]

### 2.51.3 Decommissioning

After returning from her final deployment in October 2014, *Ingraham* was ceremoniously decommissioned on 12 November 2014 at Naval Station Everett. *Ingraham*

was officially decommissioned on 30 January 2015 at NS Everett, and is berthed at the Naval Sea Systems Command (NavSea) Inactive Ships On-site Maintenance Office at Naval Shipyard Bremerton, pending her disposal.\*[1]

#### 2.51.4 See also

- United States-Iran relations

- 1994
- 1995
- 1996
- 1997
- 1999
- 2002
- 2003
- 2004

#### 2.51.5 References

- [1] Evans, Mark L. (21 July 2015). "Ingraham IV (FFG-61)". Naval History and Heritage Command. Retrieved 13 January 2016.
- [2] "CO's Bio" . *United States Navy*. Archived from the original on 7 July 2009. Retrieved 29 May 2010.
- [3] "USS Ingraham Holds Change of Command" . *United States Navy*. Retrieved 29 May 2010.
- [4] "Iranian boats 'harass' U.S. Navy, officials say" . *CNN*. 7 January 2008. Retrieved 7 January 2008.
- [5] "Hawaii Guard, Navy bound for American Samoa" . Navy Times. 1 October 2009. Retrieved 1 October 2009.
- [6] "Ingraham Contributes to Navy's HADR mission" (PDF). Surface Warfare. 7 January 2010. Retrieved 6 September 2010.

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#### 2.51.6 External links

- USS *Ingraham* official website
- Photo gallery of USS *Ingraham* (FFG-61) at NavSource Naval History
- navysite.de: USS *Ingraham*
- MaritimeQuest USS Ingraham FFG-61 pages
- Video of January 2008 incident in the Strait of Hormuz
- - USS *Ingraham* (FFG-61) command histories
    - Naval History & Heritage Command
    - 1989
    - 1990
    - 1992
    - 1993

# Chapter 3

## Royal Australian Navy

### 3.1 Adelaide-class frigate

The **Adelaide class** is a ship class of six guided missile frigates constructed in Australia and the United States of America for service in the Royal Australian Navy. The class is based on the United States Navy's *Oliver Hazard Perry*-class frigates, but modified for Australian requirements. The first four vessels were built in the United States, while the other two were constructed in Australia.

The first ship entered service in November 1980, and three of the six ships are active as of 2015. *Canberra* and *Adelaide* were paid off in 2005 and 2008 respectively, and later sunk as dive wrecks: their decommissioning was to offset the cost of a A\$1 billion weapons and equipment upgrade to the remaining four ships. *Sydney* was decommissioned in late 2015, after spending most of the year as a moored training ship. The *Hobart*-class air-warfare destroyers will replace the remaining frigates from 2016 onwards.

#### 3.1.1 Construction and acquisition

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives.<sup>\*[1]</sup> Although the Type 42 met the RAN's requirements as a replacement for the cancelled light destroyers and the *Daring*-class destroyers, fitting the ship with the SM-1 missile would have been difficult.<sup>\*[1]</sup> On the other hand, the *Perry* class was still at the design stage; a design that was described by assessment project staff as "a second rate escort that falls short of the DDL [light destroyer] requirements on virtually every respect".<sup>\*[1]\*[2]</sup> Despite this, the Australian government approved the purchase of two US-built *Perry*-class ships in 1974.<sup>\*[1]</sup>

The risk of acquiring an unproven design was seen as acceptable because of the success of the USN's *Charles F. Adams*-class destroyer (of which the RAN operated three ships as the *Perth* class), when compared to the equivalent British ships the RAN would have purchased.<sup>\*[2]</sup> Final government approval to order two ships was granted in 1976, with a third ship ordered in 1977.<sup>\*[3]</sup> The

order was later expanded with the order of a fourth unit.<sup>\*[4]</sup> These four ships were built by Todd Pacific Shipyards of Seattle, Washington, as part of the USN's shipbuilding program, and were assigned USN hull numbers during construction, which were replaced with RAN pennant numbers upon entering service.<sup>\*[5]</sup> The first, HMAS *Adelaide* (USN hull number FFG-17, RAN pennant number FFG 01) was built to the Flight I design, while *Canberra* (FFG-18/FFG 02) and *Sydney* (FFG-35/FFG 03) were the first and last ships of the Flight II design, respectively.<sup>\*[5]</sup> The final American-built ship was *Darwin* (FFG-44/FFG 04); constructed to the Flight III design.<sup>\*[5]</sup> In 1980, two more ships (*Melbourne* and *Newcastle*) were ordered, but were built in Australia by AMECON of Williamstown, Victoria, and did not receive USN numbers.<sup>\*[4]\*[5]</sup>

#### 3.1.2 Armament

Since the withdrawal of the *Perth*-class destroyers, these ships are the RAN's primary air defence vessels, armed with a Mark 13 missile launcher for SM-2 missiles. They also have significant anti-surface capability, being armed with a 76-millimetre (3.0 in) Mk 75 gun and the Harpoon ASM (also fired by the Mark 13 launcher), and a pair of triple torpedo tubes for ASW. In addition, two S-70B Seahawk helicopters are carried.



HMAS *Canberra* firing a Harpoon anti-ship missile

From 2005 onwards, all RAN frigates deploying to the

Persian Gulf are fitted with two M2HB .50 calibre machine guns in Mini Typhoon mounts, installed on the aft corners of the hangar roof.\*[6] Two TopLite EO directors are used with the guns.\*[6]

The Australian frigates were originally fitted with American **Mark 46** anti-submarine torpedoes, but by 2008, they had been replaced with the European **MU90 Impact** torpedo in three of the four frigates as part of the FFG Upgrade, with the conversion of *Newcastle* underway at that point.\*[7]

### 3.1.3 Upgrades

There have been two major upgrades distinguishing the *Adeelaide* class from the American *Oliver Hazard Perry*-class frigates.

#### Lengthening

The first three ships were constructed to the *Perry* class' 'short' hull design (Flight I and II), with an identical length for both the main deck and the keel.\*[5] Ships from FFG-36 onwards (including *Darwin*) were built with an increase in overall length—achieved by angling the transom (the section between the fantail and the keel) to increase the area of the flight deck and allow the operation of *Seahawk* helicopters.\*[5] *Adeelaide*, *Canberra*, and *Sydney* were later upgraded to match the slightly larger ships, and were fitted with the updated sonars and ESM systems of the Flight III design.\*[5]

#### FFG Upgrade

In the mid-1990s, the Australian government commenced SEA 1390, also known as the FFG Upgrade Project.\*[8] Originally costing A\$1 billion, which has expanded to A\$1.46 billion, the project includes improvements to the combat and fire control system, the sonar suite, and the air defence missiles.\*[8] The upgrade was for four ships and intended to expand their service life to approximately 2020.\*[8] The project cost was partly offset by the decommissioning of the two oldest units.\*[9] *Canberra* paying off in 2005 and *Adeelaide* in 2008. Modification of each ship took place at Garden Island Dockyard, with **Australian Defence Industries** (ADI, now **Thales Australia**) selected as project leader for the upgrade phase of the project.\*[8]

After the refit, the ships are capable of firing **SM-2MR** and **RGM-84 Harpoon** missiles from the Mark 13 launcher.\*[8] An 8-cell **Mark 41 Vertical Launch System** for **Evolved Sea Sparrow Missile** has also been installed forward of the Mark 13 launcher.\*[8] The **Phalanx CIWS** was upgraded to Block 1B, and the torpedoes, missiles, and other ship-mounted weapons were upgraded to the latest versions.\*[8]



HMAS Sydney 's Mk 41 VLS in 2007

By January 2008, the FFG Upgrade Project was running at least four years behind schedule.\*[10] The frigates' anti-missile and anti-torpedo detection and defence systems could not be integrated as intended, leaving the ships vulnerable to attack.\*[10] The first ship refitted, HMAS *Sydney*, was initially not accepted back into service by the RAN because of the problems, which have also prevented any refitted ship from serving in a combat zone.\*[11] Australian Defence Association executives and serving navy personnel have blamed both political parties for the problems: while the **Howard Liberal** government was responsible for the project, the preceding Labor government chose to maintain the frigates instead replacing them with the more expensive and much more labour-intensive, but more capable **Kidd**-class destroyers in the early 1990s.\*[8]\*[11]

By November 2008, *Darwin*'s upgrade had been completed, while the problems experienced with *Sydney* had been rectified in both ships.\*[12] It is planned to start deploying these warships to the Gulf in 2009.\*[12] The RAN and Thales subsequently claimed that the two upgraded ships were the "most capable ships in the history of the RAN", and that once the other two *Adelettes* were upgraded, the navy would possess the "most lethal frigate fleet on earth".\* [12] It was reported at the same time that other nations operating guided missile frigates, including the United States, Canada, Greece, and Turkey, were considering similar upgrades.\*[12]



Sydney (*foreground*) and Darwin *alongside* at Fleet Base East in 2011

### 3.1.4 Fates

*Canberra* and *Adelaide* were decommissioned to offset the cost of upgrading the remaining four ships, with *Canberra* decommissioned on 12 November 2005 and *Adelaide* on 19 January 2008.\*[9]\*[13]



Adelaide *submerging* off Avoca Beach on 13 April 2011

*Canberra* was subsequently sunk as a dive wreck on 4 October 2009, 2 nautical miles (3.7 km; 2.3 mi) off Ocean Grove, Victoria, in 30 metres (98 ft) of water.\*[14] *Adelaide* was converted into a dive wreck, but plans to scuttle her off Avoca Beach, New South Wales in April 2010 were postponed following protests by resident action groups and a tribunal hearing, which ordered the removal of wiring and paint from sections of the frigate before she was sunk on 13 April 2011.\*[15]\*[16]\*[17]

*Sydney* entered port for the final time in February 2015, but remained commissioned as an alongside training ship until 7 November.\*[18]\*[19]

The upgraded *Adelaide*-class frigates will be replaced by three new *Hobart* class air defence destroyers, equipped with the Aegis combat system, starting around 2016.

### 3.1.5 Ships

### 3.1.6 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pgs. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Scott, 'Enhanced small-calibre systems offer shipborne stopping power
- [7] Fish & Grevatt, *Australia's HMAS Toowoomba test fires MU90 torpedo*
- [8] *Australia's Hazard(ous) Frigate Upgrade*, in *Defense Industry Daily*
- [9] Saunders (ed.), *Jane's Fighting Ships 2008–2009*, p. 28
- [10] Kirk & staff, *Dud frigates an inherited nightmare*
- [11] McPhedran, *Frigates 'can't go to war' despite \$1.4bn upgrade*
- [12] McPhedran, *Australia's naval frigates 'worth the wait'*
- [13] Australian Department of Defence, *HMAS Adelaide Decommissions*
- [14] Draper, 'Old Warship sunk off Victoria's coast
- [15] Harvey & West, *Judge orders tough new rules for scuttling*
- [16] Fish, *Australia's Adelaide ends 27 years of service*
- [17] Westbrook, *Dolphins frolic, protesters sunk as frigate sent to the bottom*
- [18] "Final entry into Sydney for city's namesake warship" (Press release). Department of Defence. 27 February 2015. Retrieved 27 February 2015.
- [19] "HMAS Sydney decommissioned after 32 years of service". *ABC News* (Australian Broadcasting Corporation). 7 November 2015. Retrieved 7 November 2015.

### 3.1.7 References

#### Books

- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmer, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- Jones, Peter (2001). "1972–1983: Towards Self-Reliance". In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.

- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Saunders, Stephen, ed. (2008). *Jane's Fighting Ships 2008–2009*. Jane's Fighting Ships (111th ed.). Surrey: Jane's Information Group. ISBN 978-0-7106-2845-9. OCLC 225431774.

### Journal articles

- Fish, Tim; Grevatt, Jon (24 June 2008). “Australia's HMAS Toowoomba test fires MU90 torpedo”. *Jane's Navy International* (Jane's Information Group).
- Fish, Tim (1 March 2008). “Australia's Adelaide ends 27 years of service”. *Jane's Navy International* (Jane's Information Group).
- Hooton, E.R. (1 December 1996). “Perking-up the Perry class”. *Jane's International Defence Review* (Jane's Information Group) 9 (9).
- Scott, Richard (12 December 2007). “Enhanced small-calibre systems offer shipborne stopping power”. *International Defence Review* (Jane's Information Group).

### News articles

- Draper, Michelle (4 October 2009). “Old Warship sunk off Victoria's coast”. *Sydney Morning Herald*. Archived from the original on 4 October 2009. Retrieved 4 October 2009.
- Kirk, Alexandra; (and staff) (2 January 2008). “Dud frigates an inherited nightmare”. *ABC News* (Australian Broadcasting Corporation). Retrieved 2008-04-22.
- Harvey, Ellie; West, Andrew (16 September 2010). “Judge orders tough new rules for scuttling”. *The Sydney Morning Herald*. Archived from the original on 18 September 2010. Retrieved 20 September 2010.
- McPhedran, Ian (2 January 2008). “Frigates 'can't go to war' despite \$1.4bn upgrade”. *The Advertiser* (News Limited). Archived from the original on 4 Jan 2008. Retrieved 2008-04-21.
- McPhedran, Ian (19 November 2008). “Australia's naval frigates 'worth the wait'”. *The Daily Telegraph*. Retrieved 21 November 2008.
- Westbrook, Tom (13 April 2011). “Dolphins frolic, protesters sunk as frigate sent to the bottom”. *The Australian*. Retrieved 14 April 2011.

### Websites and other media

- “Australia's Hazard(ous) Frigate Upgrade”. *Defense Industry Daily*. Watershed Publishing. 14 January 2008. Retrieved 21 April 2008.
- “HMAS *Adelaide* Decommissions” (Press release). Australian Department of Defence. 20 January 2008. Retrieved 2008-01-20.

### 3.1.8 Further reading

- Earnshaw, Dr. Paul (September–October 1997). “The Australian Frigate Project” (PDF). *Australian Defence Force Journal* (Department of Defence) (127). Retrieved 2009-04-24.

### 3.1.9 External links

- Guided Missile Frigate (FFG), Royal Australian Navy webpage for the class
- “FFG Ship Upgrade Project”. Archived from the original on 15 Jul 2008.

## 3.2 HMAS Adelaide (FFG 01)

For other ships of the same name, see [HMAS Adelaide](#).

**HMAS *Adelaide* (FFG 01)** was the lead ship of the *Adelaide* class of guided missile frigates built for the Royal Australian Navy, based on the United States Navy's *Oliver Hazard Perry* class frigates. She was built in the United States of America and commissioned into the RAN in 1980.

During her career, *Adelaide* was part of Australian responses or contributions to the 1987 Fijian coups d'état, the Iraq invasion of Kuwait, the Indonesian riots of May 1998, the INTERFET peacekeeping taskforce, the War in Afghanistan, and the United States-led invasion of Iraq. In 1997, the frigate rescued two competitors in the 1996–97 Vendée Globe solo, round-the-world yacht race. In 2001, a boat carrying suspected illegal immigrants was intercepted by *Adelaide*; the events of this interception became the centre of the Children overboard affair.

In 2008, *Adelaide* was the second ship of the class to be decommissioned, in order to offset the cost of an upgrade to the other four vessels. This ship was to be sunk off Avoca Beach, New South Wales as a dive wreck on 27 March 2010, until an appeal to the Administrative Appeals Tribunal by protest groups led to a postponement of the scuttling until additional cleanup work was completed. Despite further attempts to delay or cancel the scuttling, *Adelaide* was sunk off Avoca on 13 April 2011.

### 3.2.1 Design and construction

Main article: Adelaide-class frigate

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.\*[1] Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built *Oliver Hazard Perry*-class frigates (including *Adelaide*) in 1976.\*[1]\*[2] A third was ordered in 1977, followed by a fourth, with all four ships integrated into the USN's shipbuilding program.\*[3]\*[4]\*[5] A further two ships were ordered in 1980, and were constructed in Australia.\*[4]\*[5]

As designed, the ship had a full load displacement of 3,605 tons, a length overall of 135.6 metres (445 ft), a beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).\*[6]\*[7] Early in the ship's career, she was modified from the *Oliver Hazard Perry* FLIGHT I design to FLIGHT III, requiring a lengthening of the helicopter deck for the RAST helicopter recovery system, increasing the displacement to 4,100 tons and pushing the overall length to 138.1 metres (453 ft).\*[7] Propulsion machinery consists of two General Electric LM2500 gas turbines, which provide a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.\*[7] Top speed is 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).\*[7] Two 650-horsepower (480 kW) electric auxiliary propulsors are used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).\*[7] Standard ship's company is 184, including 15 officers, but excluding the flight crew for the embarked helicopters.\*[7]

Original armament for the ship consisted of a Mark 13 missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.\*[6]\*[7] For anti-submarine warfare, two Mark 32 torpedo tube sets are fitted; originally firing the Mark 44 torpedo, the *Adelaide*s later carried the Mark 46 torpedoes.\*[7] Up to six 12.7-millimetre (0.50 in) machine guns can be carried for close-in defence, and since 2005, two M2HB .50 calibre machine guns in Mini Typhoon mounts have been installed when needed for Persian Gulf deployments.\*[7]\*[8] The sensor suite includes an AN/SPS-49 air search radar, AN/SPS-55 surface search and navigation radar, SPG-60 fire control radar connected to a Mark 92 fire control system, and an AN/SQS-56 hull-mounted sonar.\*[7] Two helicopters can be embarked: either two S-70B Seahawk or one Sea-



*Adelaide's Mark 13 launcher, with a dummy Standard missile loaded*

hawk and one AS350B Squirrel.\*[7]

*Adelaide* was laid down to the *Perry* class' Flight I design at Todd Pacific Shipyards at Seattle, Washington on 29 July 1977, launched on 21 June 1978 by Lady Ann Synnot (wife of Chief of Naval Staff Admiral Sir Anthony Synnot), and commissioned into the Royal Australian Navy on 15 November 1980.\*[5]\*[9] During construction, she was identified with the United States Navy hull number FFG-17.\*[5] A total of four *Adelaide* class ships were constructed by Todd Pacific, with a further two built by Australian shipbuilder AMECON.\*[1]

### 3.2.2 Operational history

After commissioning, *Adelaide* and *Canberra* remained in the United States to work up; during this time both ships were attached to the United States Navy's Destroyer Squadron 9.\*[10] The frigate ran aground off Seattle in early 1981, during post-commissioning trials, but was freed with only minor damage.\*[11]

Following the decommissioning of the aircraft carrier HMAS *Melbourne* in 1982 and the disbandment of fixed-wing aviation squadrons in 1984, the RAN Fleet Air Arm became focused on helicopter operations, but had minimal experience flying helicopters from small ships.\*[12] To remedy this, a Bell Kiowa was embarked aboard *Adelaide* during 1984.\*[12] *Adelaide* was awarded the Gloucester Cup for being the most efficient ship in the RAN during 1984.\*[9]\*[13]

In May 1987, *Adelaide* visited Fiji, and was alongside in Lautoka when the first of the 1987 Fijian coups d'état occurred on 14 May.\*[14] *Adelaide* and sister ship *Sydney*, alongside in Suva, were instructed to remain off Fiji to aid in any necessary evacuation of Australian citizens; the first component of what became **Operation Morris Dance**.\*[14] *Adelaide* remained on station until at least 29 May, when a phased withdrawal began.\*[14]

On 3 July 1990, *Adelaide* became the first Australian warship to visit Tahiti since 1970.\*[15] On 10 August, *Adelaide*, sister ship *Darwin*, and the replenishment ship *Success* were deployed to the Middle East as part of Operation Damask, Australia's participation in the international coalition enforcing sanctions against Iraq following that nation's invasion of Kuwait.\*[16] *Adelaide* and *Darwin* remained in the area until 3 December, and was used for surveillance and boarding operations.\*[15]\*[17] In October 1992, *Adelaide*'s home port was changed to HMAS *Stirling*, making her the first ship of the class homeported in Western Australia under the Two-Ocean Policy.\*[18]



*Adelaide* underway in 1982

In January 1997, the yachts of Thierry Dubois and Tony Bullimore (competitors in the 1996–97 Vendée Globe solo, round-the-world yacht race), capsized while attempting to cross the Southern Ocean.\*[19] *Adelaide* successfully found and rescued the sailors after seven days of searching by ships and aircraft.\*[19] During late May and early June, the frigate was deployed to the Philippines, and represented Australia at the Philippines Centenary International Naval Review.\*[20]

Between 17 and 27 May 1998, *Adelaide* was one of four RAN ships placed on standby, in case Australian citizens required evacuation if the Indonesian riots of May 1998 escalated.\*[21] The ships were not used. Starting in September, the frigate accompanied the destroyers *Hobart* and *Brisbane* on a cruise through South East Asia.\*[22] During this deployment, the ships were present at a naval review by Indonesian president Bacharuddin Jusuf Habibie.\*[22]

In February 1999, *Adelaide* was awarded the Duke of

Gloucester Cup, awarded to the most efficient ship in the RAN during the previous year.\*[23] The frigate was deployed to East Timor as part of the Australian-led INTERFET peacekeeping taskforce from 19 September to 19 October.\*[24]

On 6 October 2001, *Adelaide* was the ship which intercepted SIEV 4, the event which sparked the Children overboard affair.\*[25] Under orders to prevent SIEVs from entering Australian waters, *Adelaide* attempted to warn the craft, carrying over 200 passengers (including children), against crossing from international waters during the night and into 7 October. When the SIEV failed to heed these warnings, *Adelaide* fired warning shots and initiated a RHIB boarding action, with the boarding party took control of the craft that afternoon.\*[25] Between this time and when the craft was manoeuvred from Australian territory late the next morning, several attempts were made to sabotage the craft, and some adult passengers jumped or were thrown overboard while others threatened to do so; the fourteen people that entered the water were recovered by the frigate's RHIB and taken back to the SIEV.\*[25] *Adelaide* observed the craft as it headed towards Indonesia, and moved in to provide further assistance a few hours later, after systematic sabotage immobilised the small vessel.\*[25] *Adelaide* was instructed to take the vessel in tow and head for Christmas Island.\*[25] The SIEV began to take on water during the afternoon of 8 October, and despite the appearance that the problem had been rectified, the craft sank without warning at 17:00.\*[25] All aboard were forced into the water, and were rescued by personnel from *Adelaide*.\*[25] Reports of the sinking were conflated with information about those who jumped or were thrown overboard the day previous to give the impression that the threat of throwing children overboard had been made or carried out, a story that was later proven false but taken up at the time by the Howard government during the lead-up to the 2001 election to support their campaign promises to tighten border controls and immigration.\*[25]\*[26]

From November 2001 to March 2002, *Adelaide* and the amphibious warfare ship *Kanimbla* were deployed to the Middle East as part of Operation Slipper, the Australian contribution to the War in Afghanistan.\*[27] The ships also contributed to the continuing enforcement of the Iraq sanctions.\*[27] *Adelaide* was deployed on border protection operations on multiple occasions until 2004.\*[18]

*Adelaide* returned to the Middle East from July 2004 to January 2005 as part of Operation Catalyst, the Australian contribution to the reconstruction of Iraq following the United States-led invasion in 2003.\*[28] During this deployment, in December 2004, several gunboats of the Iranian Revolutionary Guard attempted to capture a boarding party after it had inspected the freighter MV *Sham*, which had grounded near the Iraq-Iran maritime boundary.\*[29]\*[30] After completing their inspection, the boarding party returned to their two RHIBs, but were approached by an Iranian gunboat.\*[29]\*[30] The board-

ing party climbed back aboard *Sham*, took up defensive positions, and, according to BBC reporter Frank Gardner, “warned [the Iranians] to back off, using what was said to be ‘highly colourful language’.” \*[29]\*[30] During the next 45 minutes, four more gunboats arrived, and the stand-off lasted for four hours before the Australians were evacuated by *Adelaide*'s *Seahawk* helicopter.\*[30] No shots were fired during the incident, and two of the Australians were later awarded the Distinguished Service Medal for their conduct during the stand-off.\*[30] The Australian Defence Force did not immediately report the incident to the media, as they felt no need to highlight it, and the attempted capture did not come to light until July 2007, when Gardner wrote about it following the capture of 15 British personnel during a similar incident in March 2007.\*[29]\*[30]

A March 2010 reorganisation of battle honours awarded to RAN ships saw *Adelaide* retroactively honoured for her service with INTERFET (“East Timor 1999”) and during the War in Afghanistan (“Persian Gulf 2001–02”).\*[31]\*[32]

### 3.2.3 Decommissioning and fate

*Adelaide* was originally scheduled to be paid off in November 2006, but delays with the project to upgrade four of *Adelaide*'s sister ships required that she be kept in service for another fourteen months to minimise the impact on the fleet.\*[33] *Adelaide* was decommissioned on 19 January 2008 at HMAS *Stirling*, before she was towed to Sydney and given to the New South Wales Government, which planned to sink her as a dive wreck off the coast near Terrigal: the first military ship dive wreck in New South Wales.\*[33]\*[34] After spending time alongside at HMAS *Kuttabul*, *Adelaide* was towed to White Bay at a point prior to November 2009.\*[35]



*Adelaide* tied up at White Bay in April 2010. The vessel has been prepared for scuttling: weapons and systems have been removed, masts have been cut short, and diver access holes have been prepared.

The ship was prepared for scuttling during late 2009 and

early 2010: her mast (which would have become a navigational hazard once the ship was scuttled) was removed, dangerous materials and toxins were removed, and access holes were cut in the ship's flanks.\*[35]\*[36] The ship was scheduled to be sunk on 27 March, 1.7 kilometres (1.1 mi) offshore from Avoca Beach, New South Wales, in 32 metres (105 ft) of water.\*[36] Local resident action groups campaigned to prevent the scuttling, claiming that the wreck would affect tides and littoral sand drift, and that the removal of chemicals and hazardous materials in the ship had not been thorough enough, with the chance that marine life and people could be poisoned.\*[36]\*[37]

An appeal by the protest groups to the Administrative Appeals Tribunal three days before the sinking saw the project placed on hold until the case could be heard in full: supporters and opponents of the dive wreck agreed to participate in mediation in the meantime.\*[38]\*[39] The case was to be heard on 5 May, but was later postponed to July.\*[40]\*[41] On 15 September, the Tribunal ruled that scuttling of the ship could go ahead after the removal of any remaining wiring, which may contain polychlorinated biphenyls, canvas, insulation, and exfoliating red lead paint.\*[42]\*[43] The delays caused by the tribunal hearing meant that the original \$5.8 million assigned to the scuttling project was expended, and the tribunal hearing, additional cleanup, and berthing fees brought the cost of the scuttling project to \$8.5 million.\*[42]



*Adelaide* submerging after the scuttling charges were fired

A new scuttling date was announced on 24 February 2011 by NSW Lands Minister Tony Kelly, with *Adelaide* scheduled to be sunk on 13 April 2011, after the additional cleaning ordered by the Administrative Appeals Tribunal was completed in March.\*[44] *Adelaide* was towed from Sydney Harbour on the morning of 11 April for the voyage north.\*[45] The action group attempted to cancel or further delay the sinking of the warship, requesting that the New South Wales Ombudsman investigate the government's handling of the artificial reef project, filing a summons in the Land and Environment Court of New South Wales on the afternoon of 12 April, and asking an Aboriginal 'whale caller' to summon humpback whales to the planned wreck site.\*[46]\*[47]

Despite this, the sinking went ahead just before midday on 13 April, after being delayed by over an hour by a pod of dolphins inside the 1 kilometre (0.62 mi) exclusion zone.\*[47] After the scuttling charges were fired, *Adeelaide* submerged within two minutes.\*[11] While initially resting with the truncated mast sitting 18 metres (59 ft) below sea level, by 2014, the wreck had subsided to put the mast 22 metres (72 ft) below; the increased depth means that potential divers must have completed an advanced adventurer course in addition to having basic scuba diving certification.\*[48] By May 2014, just under 11,000 dive permits had been issued for the site, and local diving tour operators have estimated a fourfold increase in diver tourism compared to before the scuttling.\*[48]

### 3.2.4 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977–78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998–99*, p. 26
- [8] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [9] Perryman, *Ships Named Adelaide*, p. 2
- [10] Cranston, Frank (16 August 1981). “The new Canberra is coming along proudly”. *The Canberra Times (ACT : 1926 – 1995)* (ACT: National Library of Australia). p. 9. Retrieved 6 April 2015.
- [11] Westbrook, *Dolphins frolic, protesters sunk as frigate sent to the bottom*
- [12] Jones, in Stevens, *The Royal Australian Navy*, p. 247
- [13] “The Duke of Gloucester's Cup”. Royal Australian Navy. Retrieved 8 August 2015.
- [14] Jones, in Stevens, *The Royal Australian Navy*, p. 260
- [15] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 6
- [16] Jones, in Stevens, *The Royal Australian Navy*, p. 261
- [17] Jones, in Stevens, *The Royal Australian Navy*, p. 263
- [18] Perryman, *Ships Named Adelaide*, p. 3
- [19] Grazebrook, *A Drop in the Ocean?*
- [20] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 28
- [21] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 34
- [22] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 35
- [23] *Adelaide's pair of cups*, in *Navy News*
- [24] Stevens, *Strength Through Diversity*, p. 15
- [25] Senate Select Committee, *A Certain Maritime Incident*
- [26] Senate Select Committee, *Executive Summary*
- [27] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 44
- [28] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 60
- [29] Gardner, *Iran 'unable to take Australians'*
- [30] Australian Associated Press, *Australians repelled Iranian navy*
- [31] Royal Australian Navy, *Navy Marks 109th Birthday With Historic Changes To Battle Honours*
- [32] Royal Australian Navy, *Royal Australian Navy Ship/Unit Battle Honours*
- [33] Fish, *Australia's Adelaide ends 27 years of service*
- [34] Nelson, *Warship to be sunk off New South Wales coast* [press release]
- [35] Collins, *HMAS Adelaide was stripped of her mast at White Bay last Thursday*
- [36] West, *Scuttled ship would wreck bay: residents*
- [37] Trembath, *HMAS Adelaide to sleep with the fishes*
- [38] ABC News, *Plans to sink warship scuttled by court order*
- [39] Tovey & Harvey, *Tribunal scuppers plan to sink ship*
- [40] West, *Judge fires broadside at rush to sink warship*
- [41] West, *New tests ordered for warship toxins*
- [42] Harvey & West, *Judge orders tough new rules for scuttling*
- [43] Australian Associated Press, *More money sinks with HMAS Adelaide*
- [44] Australian Associated Press, *Greenies try to scuttle plans to sink HMAS Adelaide*
- [45] Australian Associated Press, *Decommissioned HMAS Adelaide towed to sea*
- [46] Australian Broadcasting Corporation, *HMAS Adelaide en route to final destination*
- [47] McMahon, *Dolphins delay scuttling of HMAS Adelaide*
- [48] Michael, Sarah (21 May 2014). “Water views: Incredible pictures of warship sunk off NSW coast that's become underwater playground for scuba divers”. *Daily Mail Online Australia*. Retrieved 8 June 2014.

### 3.2.5 References

#### Books

- Bendle, Vanessa; Griffin, David; Laurence, Peter; McMillan, Richard; Mitchell, Brett, Nasg, Greg; Perryman, John; Stevens, David; Wheate, Nial (2005). *Database of Royal Australian Navy Operations, 1990–2005* (PDF). Working Papers **18**. Canberra, ACT: Sea Power Centre – Australia. ISBN 0-642-29623-5. Retrieved 16 August 2009.
- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977–78*. Jane's Fighting Ships (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.
- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998–99*. Jane's Fighting Ships (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.
- Stevens, David (2007). *Strength Through Diversity: The combined naval role in Operation Stabilise* (PDF). Working Papers **20**. Canberra: Sea Power Centre – Australia. ISBN 978-0-642-29676-4. ISSN 1834-7231. Retrieved 6 September 2010.
- Stevens, David, ed. (2001). *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
  - Jones, Peter. "Towards Self Reliance"; "A Period of Change and Uncertainty". *The Royal Australian Navy*.
  - Spurling, Kathryn. "The Era of Defence Reform". *The Royal Australian Navy*.

#### Journal articles

- Hooton, E.R. (1 December 1996). "Perking-up the Perry class". *Jane's International Defence Review* (Jane's Information Group) **9** (9).
- Perryman, John (July 2015). "Ships Named Adelaide" (PDF). *Semaphore* (Sea Power Centre – Australia) **2015** (4). Retrieved 8 August 2015.

- Scott, Richard (12 December 2007). "Enhanced small-calibre systems offer shipborne stopping power". *International Defence Review* (Jane's Information Group).

#### News articles

- ABC News (25 March 2010). "Plans to sink warship scuttled by court order". *ABC News* (Australian Broadcasting Corporation). Retrieved 25 March 2010.
- "HMAS Adelaide en route to final destination". *ABC News Online* (Australian Broadcasting Corporation). 11 April 2011. Retrieved 11 April 2011.
- "Adelaide's pair of cups". *Navy News*. 22 February 1999. Retrieved 29 July 2009.
- Australian Associated Press (22 June 2007). "Australians repelled Iranian navy". *The Age* (Melbourne). Retrieved 24 February 2011.
- Australian Associated Press (15 September 2010). "More money sinks with HMAS Adelaide". *The Sydney Morning Herald*. Retrieved 26 September 2010.
- Australian Associated Press (24 February 2011). "Greenies try to scuttle plans to sink HMAS Adelaide". *Adelaide Now*. Retrieved 25 February 2011.
- "Australian Associated Press". *Decommissioned HMAS Adelaide towed to sea* (Sydney Morning Herald). 11 April 2011. Retrieved 11 April 2011.
- Collins, Terry (18 November 2009). "HMAS Adelaide was stripped of her mast at White Bay last Thursday". *Inner West Courier*. Retrieved 19 November 2009.
- Fish, Tim (1 March 2008). "Australia's Adelaide ends 27 years of service". *Jane's Navy International* (Jane's Information Group).
- Gardner, Frank (21 June 2007). "Iran 'unable to take Australians'". *BBC*. Retrieved 24 February 2011.
- Grazebrook, A.W. (1 March 1997). "A Drop in the Ocean?". *Jane's Navy International* (Jane's Information Group).
- Harvey, Ellie; West, Andrew (16 September 2010). "Judge orders tough new rules for scuttling". *The Sydney Morning Herald*. Retrieved 20 September 2010.
- McMahon, Jeanette (13 April 2011). "Dolphins delay scuttling of HMAS Adelaide". *1223 ABC Newcastle* (Australian Broadcasting Corporation). Retrieved 14 April 2011.

- Royal Australian Navy (1 March 2010). “Navy Marks 109th Birthday With Historic Changes To Battle Honours”. Royal Australian Navy. Retrieved 14 March 2010.
- Tovey, Josephine; Harvey, Ellie (25 March 2010). “Tribunal scuppers plan to sink ship” . *The Sydney Morning Herald*. Retrieved 25 March 2010.
- Trembath, Brendan (5 March 2010). “HMAS Adelaide to sleep with the fishes” . ABC News. Retrieved 12 March 2010.
- West, Andrew (7 March 2010). “Scuttled ship would wreck bay: residents” . *The Sydney Morning Herald*. Retrieved 12 March 2010.
- West, Andrew (30 March 2010). “Judge fires broadside at rush to sink warship” . *The Sydney Morning Herald*. Retrieved 30 March 2010.
- West, Andrew (23 April 2010). “New tests ordered for warship toxins” . *The Sydney Morning Herald*. Retrieved 23 April 2010.
- Westbrook, Tom (13 April 2011). “Dolphins frolic, protesters sunk as frigate sent to the bottom” . *The Australian*. Retrieved 14 April 2011.

### Other sources

- “HMAS Adelaide (II)”. Royal Australian Navy. Retrieved 30 March 2010.
- “Royal Australian Navy Ship/Unit Battle Honours” (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.
- Senate Select Committee Inquiry into A Certain Maritime Incident
  - Senate Select Committee (23 October 2002). “The 'Children Overboard' Incident: Events and Initial Report” . *A Certain Maritime Incident*. Commonwealth of Australia. ISBN 0-642-71191-7. Retrieved 15 March 2010.
  - Senate Select Committee (23 October 2002). “The 'Children Overboard' Incident: Events and Initial Report” . *Executive Summary*. Commonwealth of Australia. ISBN 0-642-71191-7. Retrieved 15 March 2010.
- Brendan Nelson, Australian Minister for Defence (8 February 2007). “Warship to be sunk off New South Wales Central Coast” (Press release). Retrieved 11 December 2009.

### 3.2.6 External links

Media related to **HMAS Adelaide (FFG 01)** at Wikimedia Commons

Coordinates: 33°28'0"S 151°27'0"E / 33.46667°S 151.45000°E

## 3.3 HMAS Canberra (FFG 02)

For other ships of the same name, see **HMAS Canberra**.

**HMAS Canberra (FFG 02)** was an *Adelaide* class guided missile frigate of the Royal Australian Navy (RAN). Based on the *Oliver Hazard Perry* class design, *Canberra* was one of four *Adelaide* class ships constructed in the United States of America, and one of six to serve in the RAN.

The frigate entered service in 1981. During her career, *Canberra* was assigned to escort the *Royal Yacht Britannia* during Queen Elizabeth II's visit in 1988, helped enforce the post-Gulf War United Nations' sanctions against Iraq during 1992 and 1993, was part of the Australian responses to the 1998 Indonesian riots and the 2000 Solomon Islands Civil War, and returned to the Persian Gulf in 2002 as part of the War in Afghanistan.

In 2005, *Canberra* became the first ship of her class to be decommissioned. The frigate was marked for conversion into a dive wreck and artificial reef off Barwon Heads, Victoria, and was scuttled on 4 October 2009.

### 3.3.1 Design and construction

Main article: *Adelaide*-class frigate

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.<sup>\*[1]</sup> Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built *Oliver Hazard Perry*-class frigates (including *Canberra*) in 1976.<sup>\*[1]\*[2]</sup> A third was ordered in 1977, followed by a fourth, with all four ships integrated into the USN's shipbuilding program.<sup>\*[3]\*[4]\*[5]</sup> A further two ships were ordered in 1980, and were constructed in Australia.<sup>\*[4]\*[5]</sup>

As designed, the ship had a full load displacement of 3,605 tons, a length overall of 135.6 metres (445 ft), a

beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).<sup>\*[6]\*[7]</sup> Starting in December 1991, *Canberra* was modified from the *Oliver Hazard Perry* FLIGHT II design to FLIGHT III, requiring a lengthening of the helicopter deck for the RAST helicopter recovery system, increasing displacement to 4,100 tons and pushing the overall length to 138.1 metres (453 ft).<sup>[7]</sup> Propulsion machinery consists of two General Electric LM2500 gas turbines, which provide a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.<sup>\*[7]</sup> Top speed is 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).<sup>[7]</sup> Two 650-horsepower (480 kW) electric auxiliary propulsors are used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).<sup>\*[7]</sup> Standard ship's company is 184, including 15 officers, but excluding the flight crew for the embarked helicopters.<sup>\*[7]</sup>

Original armament for the ship consisted of a Mark 13 missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.<sup>\*[6]\*[7]</sup> For anti-submarine warfare, two Mark 32 torpedo tube sets are fitted; originally firing the Mark 44 torpedo, the *Adelaide*s later carried the Mark 46 torpedoes.<sup>\*[7]</sup> Up to six 12.7-millimetre (0.50 in) machine guns can be carried for close-in defence, and since 2005, two M2HB .50 calibre machine guns in Mini Typhoon mounts have been installed when needed for Persian Gulf deployments.<sup>\*[7]\*[8]</sup> The sensor suite includes an AN/SPS-49 air search radar, AN/SPS-55 surface search and navigation radar, SPG-60 fire control radar connected to a Mark 92 fire control system, and an AN/SQS-56 hull-mounted sonar.<sup>\*[7]</sup> Two helicopters can be embarked: either two S-70B Seahawk or one Seahawk and one AS350B Squirrel.<sup>\*[7]</sup>

*Canberra* was laid down as the first ship of the *Perry* class's Flight II design by Todd Pacific Shipyards at Seattle, Washington on 1 March 1978, and launched on 1 December 1978.<sup>\*[5]\*[9]</sup> *Canberra* was commissioned into the RAN on 21 March 1981.<sup>\*[9]\*[10]</sup> The ship received the United States Navy hull number FFG-18 during construction.<sup>\*[5]</sup>

## Armament

*Canberra*'s main weapon was the Mark 13 missile launcher located on the foredeck: this is used to fire both Harpoon and SM-2MR Standard missiles.<sup>\*[9]</sup> A 76-millimetre (3.0 in) Mark 75 OTO Melara gun is located on top of the superstructure, in front of the exhaust funnel.<sup>\*[9]\*[11]</sup> A triple-barrelled Mark 32 torpedo tube set is fitted to each side of the superstructure.<sup>\*[9]\*[11]</sup> For close defence, a 20-millimetre (0.79 in) Mark 16 Mod 2 Phalanx CIWS sits at the aft end of the superstructure, above the frigate's two helicopter hangars.<sup>\*[9]\*[11]</sup>

The hangars housed two S-70B Seahawk helicopters.<sup>\*[9]</sup>

### 3.3.2 Operational history

After commissioning, *Canberra* and *Adelaide* remained in the United States to work up; during this time both ships were attached to the United States Navy's Destroyer Squadron 9.<sup>\*[12]</sup>

*Canberra* was assigned as escort to the Royal Yacht *Britannia* during Queen Elizabeth II's visit to Australia during April and May 1988, as part of the Australian Bicentenary celebrations.<sup>\*[13]</sup>



*Canberra* launching a Harpoon

On 16 May 1990, *Canberra* was one of six Australian warships, and one of 64 naval vessels from 21 nations present at the Royal Fleet Review marking the 55th anniversary of the Royal Malaysian Navy.<sup>\*[14]</sup>

*Canberra* was deployed to the Red Sea from 13 November 1992 to 12 March 1993 following the Gulf War, as part of the enforcement of the United Nations' sanctions against Iraq.<sup>\*[15]</sup>

In December 1993, *Canberra* and the destroyer HMAS *Perth* visited Langkawi, Malaysia, for the Langkawi International Maritime and Aerospace Exhibition.<sup>\*[16]</sup> During this assignment, ship's divers from *Canberra* assisted the Royal Malaysian Police in searching for and recovering the body of a merchant sailor who had fallen overboard from MV *Leisureworld*.<sup>\*[16]</sup> Following this, the two ships sailed for New Zealand, and were present in the Bay of Islands for Waitangi Day, which commemorates the signing of the Treaty of Waitangi there on 6 February 1840, which brought New Zealand into the British Empire.<sup>\*[17]</sup>

The frigate's home base was changed from Fleet Base East in New South Wales to Fleet Base West in Western Australia in February 1996.<sup>\*[18]</sup>

On 17 May 1998, the frigate was one of four RAN ships placed on standby to help evacuate Australian citizens from Indonesia following riots.<sup>\*[19]\*[20]</sup> *Canberra* made at least one evacuation before the force was instructed to stand down a week later.<sup>\*[19]\*[20]</sup>

Following the conclusion of the Solomon Islands Civil War in 2000, *Canberra* was the last Australian warship

sent to the Solomons to support the International Peace Monitoring Team; arriving on 13 September 2001, and remaining on station until 24 October.\*[21]

After returning to Australia for Christmas and the New Year, the frigate accompanied the replenishment oiler HMAS *Westralia* to Heard Island and McDonald Islands in January 2002, where the two ships spent a month enforcing Australian sovereign rights and fisheries laws in the islands' Exclusive Economic Zone.\*[22] During this deployment, on 7 February, the ship captured the Russian fishing vessel *Volga*, which was illegally operating around Heard Island.\*[23] Later in the year, *Canberra* joined sister ship *Newcastle* and the amphibious warfare ship *Manoora* on a three-month deployment to the Persian Gulf in support of the International Coalition Against Terrorism.\*[24]

In July 2003, while operating in northern Australian waters, *Canberra* intercepted Suspected Illegal Entry Vessel (SIEV) 13, the first SIEV to be intercepted since December 2001.\*[25]

*Canberra* was decommissioned at Fleet Base West in Western Australia on 12 November 2005.\*[26]

### 3.3.3 Dive wreck



Canberra under tow to the scuttling site

In October 2006, it was announced that the decommissioned frigate would be scuttled off the coast of Barwon Heads, Victoria as a wreck diving site. In October 2006, the Federal Government allocated A\$2.8 million to the project, while the Victorian Government allocated A\$500,000.\*[27] On 23 July 2007, the Minister for Defence, Brendan Nelson, announced that in order to ensure the quickest possible schedule for the sinking of the ship, A\$7 million of federal money would be allocated to the project.\*[28]

The frigate was scheduled to be scuttled in 30 metres (98 ft) of water, 2 nautical miles (3.7 km) off Ocean Grove, Victoria on 13 September 2009, but this was postponed until 4 October because of foul weather.\*[19]\*[29]

Sixteen scuttling charges were detonated at 1400 hours, following a six-hour delay in towing the ship into position.\*[19] *Canberra* was inspected the next day by civilian clearance divers to ensure it had settled safely.\*[19] The wreck was opened to the public as a dive site on 5 December, after four mooring pylons for dive boats were installed and safety checks and remedial work were carried out.\*[30] In early 2011, Parks Victoria posted a warning that the port side of the hangar had separated from the rest of the superstructure, with frames and plating shifting up to 150 millimetres (5.9 in).\*[31] In mid-2011, Parks Victoria closed the dive site due to safety concerns following further degradation of the frigate.\*[32] After assessment, the site was reopened on 24 October 2011.\*[33]

As part of an overhaul of the RAN battle honours system, completed in March 2010, *Canberra* was retroactively awarded the battle honour "Persian Gulf 2002" for her service during the war in Afghanistan.\*[34]\*[35]

#### 3.3.4 See also

#### 3.3.5 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977-78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998-99*, p. 26
- [8] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [9] *HMAS Canberra (II)*, Royal Australian Navy
- [10] *No Name (FFG 18)*, United States Navy
- [11] Jones, in Stevens, *The Royal Australian Navy*, opp. p. 224
- [12] Cranston, Frank (16 August 1981). "The new Canberra is coming along proudly". *The Canberra Times (ACT : 1926 - 1995)* (ACT: National Library of Australia). p. 9. Retrieved 6 April 2015.
- [13] Clark, *The Fighting Canberras*, pp. 15–16
- [14] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 5
- [15] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 16
- [16] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 19
- [17] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 20

- [18] Clark, *The Fighting Canberras*, p. 15
- [19] Draper, *Old Warship sunk off Victoria's coast*
- [20] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 34
- [21] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 41
- [22] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 45
- [23] Darby, Andrew (3 December 2013). “Russia must be held to account in Greenpeace case”. *The Sydney Morning Herald*. Retrieved 6 December 2013.
- [24] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 46
- [25] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 50
- [26] ABC News, *Navy ship heads home on last voyage*
- [27] Walker, *Hopes for dive wreck scuttled*
- [28] Department of Defence, *Howard Government To Fund And Sink ex-HMAS Canberra*
- [29] Geelong Advertiser, *Scuttling of warship scuttled*
- [30] ABC News, *New 'underwater playground' for scuba divers*
- [31] West, *Call to stop scuttling as sister ship breaks up*
- [32] Ocean Grove Voice, *Ship temporarily shut*
- [33] Best, *Wreck re-opens*
- [34] “Navy Marks 109th Birthday With Historic Changes To Battle Honours”. Royal Australian Navy. 1 March 2010. Archived from the original on 13 June 2011. Retrieved 23 December 2012.
- [35] “Royal Australian Navy Ship/Unit Battle Honours” (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.

### 3.3.6 References

#### Books

- Bendle, Vanessa; Griffin, David; Laurence, Peter; McMillan, Richard; Mitchell, Brett; Nasg, Greg; Perryman, John; Stevens, David; Wheate, Nial (2005). *Database of Royal Australian Navy Operations, 1990–2005* (PDF). Working Papers 18. Canberra, ACT: Sea Power Centre – Australia. ISBN 0-642-29623-5. Retrieved 16 August 2009.
- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.

- Jones, Peter (2001). “1972–1983: Towards Self-Reliance”. In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977-78*. Jane's Fighting Ships (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.
- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998-99*. Jane's Fighting Ships (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.

#### Journal articles

- Clark, Robin (March 2001). “The Fighting Canberras”. *Canberra Historical Journal*: 9–16.
- Hooton, E.R. (1 December 1996). “Perking-up the Perry class”. *Jane's International Defence Review* (Jane's Information Group) 9 (9).
- Scott, Richard (12 December 2007). “Enhanced small-calibre systems offer shipborne stopping power”. *International Defence Review* (Jane's Information Group).

#### News articles

- “New 'underwater playground' for scuba divers”. *ABC News*. 4 December 2009. Retrieved 11 December 2009.
- “Navy ship heads home on last voyage”. *ABC News*. 7 November 2005. Retrieved 11 December 2009.
- Best, Cameron (24 October 2011). “Wreck re-opens”. *Geelong Advertiser*. Retrieved 28 October 2011.
- Draper, Michelle (4 October 2009). “Old Warship sunk off Victoria's coast”. *Sydney Morning Herald*. Retrieved 4 October 2009.
- “Scuttling of warship scuttled”. *Geelong Advertiser*. 9 September 2009. Retrieved 10 September 2009.
- Walker, Frank (22 October 2006). “Hopes for dive wreck scuttled”. *The Sun-Herald*.
- West, Andrew (9 February 2011). “Call to stop scuttling as sister ship breaks up”. *The Sydney Morning Herald (smh.com.au)*. Retrieved 28 February 2011.

- “Ship temporarily shut” . *The Ocean Grove Voice*. 4 July 2011. Retrieved 14 July 2011.

#### Other sources

- “HMAS Canberra (II)”. Royal Australian Navy. Retrieved 7 October 2012.
- “Howard Government To Fund And Sink ex-HMAS Canberra” (Press release). Department of Defence. 23 July 2007. Retrieved 24 September 2010.
- “No Name (FFG 18)”. *Naval Vessel Register*. United States Navy. 11 September 2000. Retrieved 7 October 2012.

#### 3.3.7 External links

- HMAS Canberra FFG 02 – History of the ship, maintained by a member of the frigate's commissioning crew
- Dive the ex HMAS Canberra – Victorian Artificial Reef Society site regarding the acquisition and sinking of *Canberra*

### 3.4 HMAS Sydney (FFG 03)

For other ships of the same name, see [HMAS Sydney](#).

**HMAS Sydney (FFG 03)** was an *Adelaide*-class guided-missile frigate of the Royal Australian Navy (RAN). The frigate was one of six modified *Oliver Hazard Perry*-class frigates ordered from 1977 onwards, and the third of four to be constructed in the United States of America. Laid down and launched in 1980, *Sydney* was named for the capital city of New South Wales, and commissioned into the RAN in 1983.

During her operational history, *Sydney* has been involved in Australian responses to the 1987 Fijian coups d'état and the Bougainville uprising. The frigate was deployed to the Persian Gulf on five occasions in support of United States operations during the Gulf War, War in Afghanistan, and the 2003 invasion of Iraq, and has completed two round-the-world voyages.

*Sydney* was originally expected to remain in service until 2013, but was retained in service until 2015; ceasing active deployments on 27 February and serving as a moored training ship until her decommissioning on 7 November. The frigate will be replaced in service by a *Hobart*-class destroyer.

#### 3.4.1 Design and construction

Main article: [Adelaide-class frigate](#)

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.<sup>\*[1]</sup> Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built *Oliver Hazard Perry*-class frigates in 1976.<sup>\*[1]\*[2]</sup> A third (*Sydney*) was ordered in 1977, followed by a fourth, with all four ships integrated into the USN's shipbuilding program.<sup>\*[3]\*[4]\*[5]</sup> A further two ships were ordered in 1980, and were constructed in Australia.<sup>\*[4]\*[5]</sup>

As designed, the ship had a full load displacement of 3,605 tons, a length overall of 135.6 metres (445 ft), a beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).<sup>\*[6]\*[7]</sup> Starting in February 1989, *Sydney* was modified from the *Oliver Hazard Perry* FLIGHT II design to FLIGHT III, requiring a lengthening of the helicopter deck for the RAST helicopter recovery system, which increased displacement to 4,100 tons and pushing the overall length to 138.1 metres (453 ft).<sup>\*[7]</sup> Propulsion machinery consisted of two General Electric LM2500 gas turbines, which provided a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.<sup>\*[7]</sup> Top speed was 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).<sup>\*[7]</sup> Two 650-horsepower (480 kW) electric auxiliary propulsors were used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).<sup>\*[7]</sup> Standard ship's company was 184, including 15 officers, but excluding the flight crew for the embarked helicopters.<sup>\*[7]</sup> *Sydney* was the first ship of her class to carry female sailors and officers, requiring the installation of partitioning to some mess decks.<sup>\*[8]</sup>



*Sydney* in Vancouver, Canada, in 2007. The 8-cell *Mark 41 Vertical Launch System* installed during the FFG Upgrade can be seen forward of the *Mark 13 armature missile launcher*.

Original armament for the ship consisted of a *Mark 13*

missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.<sup>\*[6]\*[7]</sup> As part of the mid-2000s FFG Upgrade Project, an eight-cell Mark 41 Vertical Launch System was fitted, with a payload of RIM-162 Evolved Sea Sparrow missiles.<sup>\*[9]</sup> For anti-submarine warfare, two Mark 32 torpedo tube sets were fitted; originally firing the Mark 44 torpedo, the *Adelaide*s later carried the Mark 46, then the MU90 Impact following the FFG Upgrade.<sup>\*[7]\*[10]</sup> Up to six 12.7-millimetre (0.50 in) machine guns could be carried for close-in defence, and since 2005, two M2HB .50 calibre machine guns in Mini Typhoon mounts were installed when needed for Persian Gulf deployments.<sup>\*[7]\*[11]</sup> The sensor suite included an AN/SPS-49 air search radar, AN/SPS-55 surface search and navigation radar, SPG-60 fire control radar connected to a Mark 92 fire control system, and an AN/SQS-56 hull-mounted sonar.<sup>\*[7]</sup> Two helicopters could be embarked: either two S-70B Seahawk or one Seahawk and one AS350B Squirrel.<sup>\*[7]</sup>

The last ship of the *Oliver Hazard Perry* Flight II design, *Sydney* was laid down at Todd Pacific Shipyards on 16 January 1980.<sup>\*[5]\*[8]\*[12]</sup> She was launched on 26 September 1980, and commissioned into the RAN on 29 January 1983.<sup>\*[8]\*[13]</sup> During construction, the ship was identified by the United States Navy hull number FFG-35.<sup>\*[5]</sup>

### 3.4.2 Operational history

From commissioning until mid-1984, *Sydney* was attached to the United States Navy's Pacific Fleet as a unit of Destroyer Squadron 9.<sup>\*[14]</sup> During this time, the frigate conducted working-up and training exercises.<sup>\*[14]</sup>

In May 1987, *Sydney* visited Fiji, and was alongside in Suva when the first of the 1987 Fijian coups d'état occurred on 14 May.<sup>\*[15]</sup> *Sydney* and sister ship *Adelaide*, alongside in Lautoka, were instructed to remain off Fiji to aid in any necessary evacuation of Australian citizens; the first component of what became Operation Morris Dance.<sup>\*[15]</sup> *Sydney* remained on station until at least 29 May, when a phased withdrawal began.<sup>\*[15]</sup>

Following the acquisition of the Vulcan Phalanx close-in weapon system and the Seahawk helicopter, *Sydney* underwent a modification refit to be capable of using these weapons.<sup>\*[8]</sup> This refit occurred over 1987 and 1988, and also saw the installation of fin stabilisation systems.<sup>\*[8]</sup>

In January 1990, *Sydney*, *Tobruk*, and *Jervis Bay* were placed on standby to evacuate civilians from Bougainville Island following the Bougainville uprising.<sup>\*[16]</sup> *Sydney* and *Tobruk* stood down in February, and the two ships departed with the submarine *Oxley* on a deployment to Turkey to commemorate the 75th anniversary of the landing at Anzac Cove.<sup>\*[16]</sup> Following Anzac Day,



Commemorative badge of the 1990 world voyage, on display in the Australian National Maritime Museum, Sydney.

*Sydney* continued on a round-the-world voyage, which included numerous diplomatic visits to European and American ports, the first visit of a RAN vessel to Sweden, and participation in a United States counter-narcotics operation in the Caribbean.<sup>\*[17]</sup> The frigate arrived home in September.<sup>\*[18]</sup>

On 3 December 1990, *Sydney* and the *Perth*-class destroyer *Brisbane* arrived in the Persian Gulf to relieve HMA Ships *Adelaide* and *Darwin* as part of Operation Damask; the Australian military contribution to the Gulf War.<sup>\*[19]</sup> *Sydney* was assigned to the escort screen around Battle Force Zulu (Task Force 154), a naval force built around four United States Navy aircraft carriers, and also participated in surveillance and boarding operations.<sup>\*[19]\*[20]</sup> The two Australian warships remained in the area until 26 March 1991.<sup>\*[20]</sup> *Sydney* was awarded the Meritorious Unit Citation on 4 November 1991 for this deployment, and later received the battle honour "Kuwait 1991".<sup>\*[21]\*[22]\*[23]</sup>



*Sydney* underway in the Persian Gulf during the Operation Damask deployment

*Sydney* was deployed back to the Persian Gulf for Operation Damask from September 1991 to February 1992, and again from June 1993 to December 1993.\*[24]

On 14 March 1994, *Sydney* rescued the crew of a yacht which had been participating in the Trans-Tasman Yacht Race before encountering difficulties.\*[25] In early October, the frigate was called on to search for survivors of a light aircraft that ditched into the Tasman Sea.\*[26]

In May 1995, *Sydney* became the first RAN warship to visit the Russian port of Vladivostok, as support for a diplomatic and trade mission.\*[27]

In 1997, *Sydney* was one of several RAN vessels placed on standby following the outbreak of political disturbances in Papua New Guinea as part of the Sandline affair.\*[28] No action was required by the Australian warships.\*[28]

*Sydney* was deployed to East Timor as part of the Australian-led INTERFET peacekeeping taskforce from 3 November to 19 December 1999.\*[29] She received the battle honour “East Timor 1999” for this deployment.\*[22]

On 1 October 2000, *Sydney* took over from sister ship *Newcastle* as the RAN vessel assigned to support the peace negotiation process in the Solomon Islands that resulted in the signing of the Townsville Peace Agreement.\*[30]

In October 2001, *Sydney* returned to the Persian Gulf to operate in support of Operation Enduring Freedom as part of the War in Afghanistan.\*[31] The frigate was joined by sister ship *Adelaide* and the amphibious warfare vessel *Kanimbla* in early December, and returned to Australia in March 2002.\*[31] *Sydney* was sent back to the Gulf in support of 2003 invasion of Iraq, operating from May to August 1993 as part of Operations Falconer and Catalyst.\*[32] The battle honours “Persian Gulf 2001–03” and “Iraq 2003” recognise these deployments.\*[22]

*Sydney* was the first of four frigates selected to go under the A\$1 billion FFG Upgrade, with HMA Ships *Darwin*, *Melbourne* and *Newcastle* following.\*[8] The upgrade features an 8-cell Mark 41 Vertical Launch System (VLS) for 32 Evolved Sea Sparrow Missiles (ESSM), upgrades to fire control and air warning radars, and replacement of the hull-mounted sonar and diesel generators.\*[8] This refit commenced in 2002, but problems with integrating the frigates' anti-missile and anti-torpedo detection and defence systems meant that when *Sydney* was finished in 2007, she was initially not accepted back into service.\*[33]\*[34] By November 2008, the problems with the upgrade had been solved.\*[35]

On the morning of 13 March 2009, *Sydney* was one of seventeen warships involved in a ceremonial fleet entry and fleet review in Sydney Harbour, the largest collection of RAN ships since the Australian Bicentenary in 1988.\*[36] The frigate led the line of thirteen ships involved in the ceremonial entry through Sydney Heads,



HMAS Sydney (FFG 03) during the International Fleet Review 2013

and anchored in the harbour for the review.\*[36]

On 20 April 2009, *Sydney* and the Anzac-class frigate HMAS *Ballarat* departed from Sydney as part of Operation Northern Trident, a six-month round-the-world voyage by the two vessels, with numerous diplomatic visits and joint exercises with foreign navies.\*[37] On 17 May, *Sydney* and *Ballarat* provided aid to two merchant vessels in the Gulf of Aden, driving off two separate groups of Somali pirates attacking the ships.\*[38] *Sydney* remained in the area to report the incidents to Combined Task Force 151, while *Ballarat* escorted an impromptu convoy of eight ships, including the two that were attacked, to safety.\*[38] The two warships visited ports in Western Europe, North America, the Pacific and northern Asia, with *Sydney* arriving back in her namesake city on 19 September.\*[39]

In May 2013, *Sydney* began a three-month deployment with the United States Seventh Fleet, attached to Carrier Strike Group Five as an escort for the carrier USS *George Washington*.\*[40]

In October 2013, *Sydney* participated in the International Fleet Review 2013 in Sydney.\*[41]

*Sydney* visited Hobart in February 2015 for the Royal Hobart Regatta.\*[42] During the weekend of 7–8 February, the frigate was anchored in the River Derwent to free up wharf space for a civilian vessel.\*[42] On attempting to return to Macquarie Wharf, the anchor chain broke, leaving the anchor 25 metres (82 ft) below.\*[42] The anchor was later recovered by divers.\*[42] The loss of the anchor prevented *Sydney* from fulfilling duties as the regatta flagship, as the ship would be unable to maintain a stationary position during the event.\*[42]

### 3.4.3 Decommissioning and fate

*Sydney* sailed into her namesake city for the final time on 27 February 2015.\*[43] Despite flying a decommissioning pennant, the frigate was not paid off until 7 November 2015; two years later than originally expected.\*[8]\*[43]\*[44] In the interim, the frigate was moored at Fleet Base East as an alongside training

ship.\*[45]

On 6 November, the day prior to paying off, a parade of 350 current and former personnel from the ship marched in Sydney.\*[46] At the time of decommissioning, *Sydney* had travelled 959,627 nautical miles (1,777,229 km; 1,104,319 mi).\*[47] She will be replaced by one of the three *Hobart*-class destroyers.\*[45]

### 3.4.4 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977-78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998-99*, p. 26
- [8] Jones, in *The Royal Australian Navy*, opp. p. 224
- [9] *Australia's Hazard(ous) Frigate Upgrade*, in *Defense Industry Daily*
- [10] Fish & Grevatt, *Australia's HMAS Toowoomba test fires MU90 torpedo*
- [11] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [12] *No Name (FFG 35)*, United States Navy
- [13] Sea Power Centre, *HMAS Sydney*
- [14] Morley, Dave (3 December 2015). "From the start to the finish". *Navy News* (Royal Australian Navy). Retrieved 8 December 2015.
- [15] Jones, in *The Royal Australian Navy*, p. 260
- [16] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 3
- [17] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, pgs. 4, 6
- [18] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 4
- [19] Jones, in *The Royal Australian Navy*, p. 263
- [20] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 7
- [21] "Navy Marks 109th Birthday With Historic Changes To Battle Honours". Royal Australian Navy. 1 March 2010. Archived from the original on 13 June 2011. Retrieved 23 December 2012.
- [22] "Royal Australian Navy Ship/Unit Battle Honours" (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.
- [23] "It's An Honour – Honours". Retrieved 3 August 2009. Citation: For meritorious operational service in the Persian Gulf during enforcement of sanctions in support of United Nations Security Council Resolutions and the subsequent period of hostilities against Iraq to liberate Kuwait in 1990–91.
- [24] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, pgs 12, 18
- [25] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 20
- [26] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 22
- [27] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 24
- [28] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 27
- [29] Stevens, *Strength Through Diversity*, p. 15
- [30] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 40
- [31] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 44
- [32] Bendle et al., *Database of Royal Australian Navy Operations, 1990–2005*, p. 48
- [33] Kirk, *Dud frigates an inherited nightmare*
- [34] McPhedran, *Frigates 'can't go to war' despite \$1.4bn upgrade*
- [35] McPhedran, *Australia's naval frigates 'worth the wait'*
- [36] Brooke, *Marching into History*
- [37] *Northern Trident 2009*, Royal Australian Navy
- [38] Dodd, *RAN warships to the rescue as Somali pirates flee*
- [39] *HMAS Sydney returns home*, ABC Online
- [40] Slavin, Erik (6 May 2013). "Australian frigate embeds with US Navy at Yokosuka, Japan". *Stars and Stripes*. Retrieved 10 May 2013.
- [41] "Participating Warships". *International Fleet Review 2013 website*. Royal Australian Navy. 2013. Archived from the original on 10 December 2013. Retrieved 14 December 2015.
- [42] Shannon, Lucy (10 February 2015). "Navy divers recover HMAS Sydney anchor which fell off in Hobart's River Derwent". *ABC News* (Australian Broadcasting Corporation). Retrieved 15 February 2015.
- [43] Australian Associated Press (27 February 2015). "<http://www.theaustralian.com.au/national-affairs/defence/hmas-sydney-sails-into-sydney-harbour-before-being-decommissioned/story-e6frg8yo-1227241618830>". *The Australian*. Retrieved 27 February 2015. External link in |title= (help)

- [44] Aubusson, Laura (5 October 2015). "Ex-Navy ship could be sunk off Coogee Beach to create artificial dive reef to boost tourism". *NewsLocal* (News Limited). Retrieved 9 October 2015.
- [45] "Final entry into Sydney for city's namesake warship" (Press release). Department of Defence. 27 February 2015. Retrieved 27 February 2015.
- [46] Australian Associated Press (AAP) (7 November 2015). "HMAS Sydney bows out after 32 years". *9news.com.au* (NineMSN). Retrieved 7 November 2015.
- [47] "HMAS Sydney decommissioned after 32 years of service". *ABC News* (Australian Broadcasting Corporation). 7 November 2015. Retrieved 7 November 2015.

### 3.4.5 References

#### Books

- Bendle, Vanessa; Griffin, David; Laurence, Peter; McMillan, Richard; Mitchell, Brett; Nasg, Greg; Perryman, John; Stevens, David; Wheate, Nial (2005). *Database of Royal Australian Navy Operations, 1990–2005* (PDF). Working Papers **18**. Canberra, ACT: Sea Power Centre – Australia. ISBN 0-642-29623-5. Retrieved 16 August 2009.
- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- Jones, Peter (2001). "1972–1983: Towards Self-Reliance". In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977-78*. Jane's Fighting Ships (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.
- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998-99*. Jane's Fighting Ships (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.
- Stevens, David (2007). *Strength Through Diversity: The combined naval role in Operation Stabilise* (PDF). Working Papers **20**. Canberra: Sea Power Centre – Australia. ISBN 978-0-642-29676-4. ISSN 1834-7231. Retrieved 6 September 2010.

#### Journal articles

- Fish, Tim; Grevatt, Jon (24 June 2008). "Australia's HMAS Toowoomba test fires MU90 torpedo". *Jane's Navy International* (Jane's Information Group).
- Hooton, E.R. (1 December 1996). "Perking-up the Perry class". *Jane's International Defence Review* (Jane's Information Group) **9** (9).
- Scott, Richard (12 December 2007). "Enhanced small-calibre systems offer shipborne stopping power". *International Defence Review* (Jane's Information Group).

#### News articles

- "HMAS Sydney returns home". ABC Online. 19 September 2009. Retrieved 28 October 2009.
- Brooke, Michael (2 April 2009). "Marching into History". *Navy News* (Department of Defence).
- Dodd, Mark (19 May 2009). "RAN warships to the rescue as Somali pirates flee". *The Australian*. Retrieved 20 May 2009.
- Kirk, Alexandra; (and staff) (2 January 2008). "Dud frigates an inherited nightmare". *ABC News* (Australian Broadcasting Corporation). Retrieved 22 April 2008. Cite uses deprecated parameter |coauthors= (help)
- McPhedran, Ian (2 January 2008). "Frigates 'can't go to war' despite \$1.4bn upgrade". *The Advertiser* (News Limited). Retrieved 21 April 2008.
- McPhedran, Ian (19 November 2008). "Australia's naval frigates 'worth the wait'". *The Daily Telegraph*. Retrieved 21 November 2008.

#### Websites and other media

- "HMAS Sydney (IV)". Royal Australian Navy. Retrieved 22 December 2012.
- "Next generation of naval ships to reflect a rich history of service" (Press release). Department of Defence. 20 January 2006. Retrieved 1 June 2009.
- "Northern Trident 2009". Royal Australian Navy. 2009. Retrieved 20 May 2009.
- "No Name (FFG 35)". *Naval Vessel Register*. United States Navy. 3 March 2000. Retrieved 22 December 2012.
- "Australia's Hazard(ous) Frigate Upgrade". *Defense Industry Daily*. Watershed Publishing. 14 January 2008. Retrieved 21 April 2008.

### 3.4.6 External links

Media related to HMAS Sydney (FFG 03) at Wikimedia Commons

- MaritimeQuest HMAS Sydney FFG-03 Photo Gallery

## 3.5 HMAS Darwin (FFG 04)

**HMAS Darwin (FFG 04)**, named for the capital city of the Northern Territory, is an *Adelaide*-class guided-missile frigate of the Royal Australian Navy (RAN). One of four ships ordered from the United States, *Darwin* entered service in 1984. During her career, she has operated in the Persian Gulf, as part of the INTERFET peacekeeping taskforce, and off the Solomon Islands. The frigate underwent a major upgrade during 2007 and 2008, and is active as of 2016.

### 3.5.1 Design and construction

Main article: *Adelaide*-class frigate

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.<sup>\*[1]</sup> Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built *Oliver Hazard Perry*-class frigates in 1976.<sup>\*[1]\*[2]</sup> A third was ordered in 1977, followed by a fourth (*Darwin*), with all four ships integrated into the USN's shipbuilding program.<sup>\*[3]\*[4]\*[5]</sup> A further two ships were ordered in 1980, and were constructed in Australia.<sup>\*[4]\*[5]</sup>

As designed, the ship had a full load displacement of 4,100 tons, a length overall of 138.1 metres (453 ft), a beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).<sup>\*[6]\*[7]</sup> Propulsion machinery consists of two General Electric LM2500 gas turbines, which provide a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.<sup>[7]</sup> Top speed is 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).<sup>[7]</sup> Two 650-horsepower (480 kW) electric auxiliary propulsors are used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).<sup>[7]</sup> Standard ship's company is 184, including 15 officers, but excluding the flight crew for the embarked helicopters.<sup>[7]</sup>



*Darwin test-firing a RIM-24 Tartar missile (not part of the ship's regular armament) from her Mark 13 missile launcher during RIMPAC 86*

Original armament for the ship consisted of a Mark 13 missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.<sup>\*[6]\*[7]</sup> As part of the mid-2000s FFG Upgrade Project, an eight-cell Mark 41 Vertical Launch System was fitted, with a payload of RIM-162 Evolved Sea Sparrow missiles.<sup>\*[8]</sup> For anti-submarine warfare, two Mark 32 torpedo tube sets are fitted; originally firing the Mark 44 torpedo, the *Adelaides* later carried the Mark 46, then the MU90 Impact following the FFG Upgrade.<sup>\*[7]\*[9]</sup> Up to six 12.7-millimetre (0.50 in) machine guns can be carried for close-in defence, and since 2005, two M2HB .50 calibre machine guns in Mini Typhoon mounts have been installed when needed for Persian Gulf deployments.<sup>\*[7]\*[10]</sup> The sensor suite includes an AN/SPS-49 air search radar, AN/SPS-55 surface search and navigation radar, SPG-60 fire control radar connected to a Mark 92 fire control system, and an AN/SQS-56 hull-mounted sonar.<sup>\*[7]</sup> Two helicopters can be embarked: either two S-70B Seahawk or one Seahawk and one AS350B Squirrel.<sup>\*[7]</sup>

The ship was laid down by Todd Pacific Shipyards at Seattle, Washington on 3 July 1981, to the *Perry* class Flight III design.<sup>\*[5]\*[11]</sup> The *Adelaides* were built as part of the United States Navy's construction program, so were assigned USN hull numbers; *Darwin* was FFG-44.<sup>\*[5]</sup> She was launched on 26 March 1982, and commissioned into the RAN on 21 July 1984.<sup>\*[11]</sup>

### 3.5.2 Operational history

During her career, *Darwin* has been deployed to the Persian Gulf on five occasions: during 1990, 1991, 1992, 2002, and 2004.<sup>\*[11]</sup>

*Darwin* was deployed to East Timor as part of the Australian-led INTERFET peacekeeping taskforce from 19 September to 3 November 1999.<sup>\*[12]</sup>

The ship was deployed to the Solomon Islands in 2001.<sup>\*[11]</sup>

*Darwin* underwent a major upgrade and refit at Garden Island during 2007 and 2008; returning to service prior to November 2008.\*[13]

On the morning of 13 March 2009, *Darwin* was one of seventeen warships involved in a ceremonial fleet entry and fleet review in Sydney Harbour, the largest collection of RAN ships since the Australian Bicentenary in 1988.\*[14] The frigate did not participate in the fleet entry, but was anchored in the harbour for the review.

Following an overhaul of the RAN battle honours system, *Darwin* was granted three battle honours in 2010: “East Timor 1999”, “Persian Gulf 2003-03”, and “Iraq 2003”.\*[15]\*[16]

In October 2013, *Darwin* participated in the International Fleet Review 2013 in Sydney.\*[17]

As of 7th January 2016, *Darwin* has sailed over 1 million nautical miles.

### 3.5.3 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977-78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998-99*, p. 26
- [8] Australia's Hazard(ous) Frigate Upgrade, in *Defense Industry Daily*
- [9] Fish & Grevatt, *Australia's HMAS Toowoomba test fires MU90 torpedo*
- [10] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [11] “HMAS Darwin”. Royal Australian Navy. Retrieved 14 October 2010.
- [12] Stevens, David (2007). *Strength Through Diversity: The combined naval role in Operation Stabilise* (PDF). Working Papers 20. Canberra: Sea Power Centre - Australia. p. 15. ISBN 978-0-642-29676-4. ISSN 1834-7231. Retrieved 6 September 2010.
- [13] McPhedran, Ian (19 November 2008). “Australia's naval frigates 'worth the wait'”. *The Daily Telegraph*. Retrieved 21 November 2008.
- [14] Brooke, Michael (2 April 2009). “Marching into History”. *Navy News* (Department of Defence).
- [15] “Navy Marks 109th Birthday With Historic Changes To Battle Honours”. Royal Australian Navy. 1 March 2010. Archived from the original on 13 June 2011. Retrieved 23 December 2012.

[16] “Royal Australian Navy Ship/Unit Battle Honours” (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.

[17] “Participating Warships”. *International Fleet Review 2013 website*. Royal Australian Navy. 2013. Archived from the original on 10 December 2013. Retrieved 14 December 2015.

### 3.5.4 References

#### Books

- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- Jones, Peter (2001). “1972–1983: Towards Self-Reliance”. In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977-78*. *Jane's Fighting Ships* (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.
- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998-99*. *Jane's Fighting Ships* (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.

#### Journal articles

- Fish, Tim; Grevatt, Jon (24 June 2008). “Australia's HMAS Toowoomba test fires MU90 torpedo”. *Jane's Navy International* (Jane's Information Group).
- Hooton, E.R. (1 December 1996). “Perking-up the Perry class”. *Jane's International Defence Review* (Jane's Information Group) 9 (9).
- Scott, Richard (12 December 2007). “Enhanced small-calibre systems offer shipborne stopping power”. *International Defence Review* (Jane's Information Group).

#### Websites

- “Australia's Hazard(ous) Frigate Upgrade”. *Defense Industry Daily*. Watershed Publishing. 14 January 2008. Retrieved 21 April 2008.

### 3.5.5 External links

## 3.6 HMAS Melbourne (FFG 05)

For other ships of the same name, see [HMAS Melbourne](#).

**HMAS Melbourne (FFG 05)** is an *Adelaide*-class guided-missile frigate of the Royal Australian Navy (RAN). The ship entered service in 1992. *Melbourne* has been deployed to the Persian Gulf on several occasions, and served as part of the INTERFET peacekeeping taskforce in 2000. The ship is operational as of 2016.

### 3.6.1 Design and construction

Main article: [Adelaide-class frigate](#)

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.<sup>\*[1]</sup> Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built *Oliver Hazard Perry*-class frigates in 1976.<sup>\*[1]\*[2]</sup> A third was ordered in 1977, followed by a fourth, with all four ships integrated into the USN's shipbuilding program.<sup>\*[3]\*[4]\*[5]</sup> A further two ships (including *Melbourne*) were ordered in 1980, and were constructed in Australia.<sup>\*[4]\*[5]</sup>

As designed, the ship had a full load displacement of 4,100 tons, a length overall of 138.1 metres (453 ft), a beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).<sup>\*[6]\*[7]</sup> Propulsion machinery consists of two General Electric LM2500 gas turbines, which provide a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.<sup>\*[7]</sup> Top speed is 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).<sup>\*[7]</sup> Two 650-horsepower (480 kW) electric auxiliary propulsors are used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).<sup>\*[7]</sup> Standard ship's company is 184, including 15 officers, but excluding the flight crew for the embarked helicopters.<sup>\*[7]</sup>

Original armament for the ship consisted of a Mark 13 missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.<sup>\*[6]\*[7]</sup> As part of the mid-2000s FFG Upgrade Project, an eight-cell Mark 41 Vertical Launch System was fitted, with a payload of RIM-162

Evolved Sea Sparrow missiles.<sup>\*[8]</sup> For anti-submarine warfare, two Mark 32 torpedo tube sets are fitted; originally firing the Mark 44 torpedo, the *Adelaides* later carried the Mark 46, then the MU90 Impact following the FFG Upgrade.<sup>\*[7]\*[9]</sup> Up to six 12.7-millimetre (0.50 in) machine guns can be carried for close-in defence, and since 2005, two M2HB .50 calibre machine guns in Mini Typhoon mounts have been installed when needed for Persian Gulf deployments.<sup>\*[7]\*[10]</sup> The sensor suite includes an AN/SPS-49 air search radar, AN/SPS-55 surface search and navigation radar, SPG-60 fire control radar connected to a Mark 92 fire control system, and an AN/SQS-56 hull-mounted sonar.<sup>\*[7]</sup> Two helicopters can be embarked: either two S-70B Seahawk or one Sea-hawk and one AS350B Squirrel.<sup>\*[7]</sup>

The ship was laid down by AMECON at Williamstown, Victoria on 12 July 1985.<sup>\*[11]</sup> She was launched on 5 May 1989.<sup>\*[11]</sup> *Melbourne* was commissioned into the RAN on 15 February 1992.<sup>\*[11]</sup>

### 3.6.2 Operational history



*Melbourne* arriving at Pearl Harbor, Hawaii in 2009



*Melbourne* operating with *HMS Diamond* in 2012

In 1996, the frigate was deployed to the Persian Gulf.

*Melbourne* was deployed to East Timor as part of the Australian-led INTERFET peacekeeping taskforce from 20 January to 23 February 2000.<sup>\*[12]</sup>

In 2002, *Melbourne* participated in the third rotation of

RAN ships to the Persian Gulf as part of Operation Slipper, where she enforced United Nations sanctions against Iraq.\*[11] In 2003, the ship returned to Iraqi waters in support of Operation Catalyst, protecting Iraqi territorial waters following Operation Iraqi Freedom.

Following an overhaul of the RAN battle honours system, completed in March 2010, *Melbourne* was awarded the honours “East Timor 2000” and “Persian Gulf 2002”.\*[13]\*[14]

On 16 August 2010, *Melbourne* was deployed to the Middle East for the third time, again as part of Operation Slipper.\*[15] During the six-month deployment, the frigate participated in anti-piracy operations in the Arabian Sea and responded to 14 distress calls from merchant vessels, including the British chemical tanker MV *CPO China* on 3 January 2011.\*[15]\*[16] Although it took six hours for *Melbourne* to close with *CPO China*, the merchant ship's crew secured themselves in the citadel, and the pirates retreated when the frigate and her Seahawk helicopter arrived.\*[16]\*[17] *Melbourne* returned to Sydney on 18 February 2011.\*[15]

Between 5 and 7 February 2014, while deployed off Tanzania, *Melbourne* seized and destroyed 575 kilograms (1,268 lb) of heroin from smuggling vessels.\*[18] On 18 February, while operating off Oman's Masirah Island, *Melbourne* and the Pakistani frigate PNS *Alamgir* intercepted and boarded a dhow found to be carrying 1,951 kilograms (4,301 lb) of cannabis resin.\*[19]

### 3.6.3 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977-78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998-99*, p. 26
- [8] *Australia's Hazard(ous) Frigate Upgrade*, in *Defense Industry Daily*
- [9] Fish & Grevatt, *Australia's HMAS Toowoomba test fires MU90 torpedo*
- [10] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [11] Royal Australian Navy, *HMAS Melbourne (III)*
- [12] Stevens, *Strength Through Diversity*, p. 15
- [13] “Navy Marks 109th Birthday With Historic Changes To Battle Honours”. Royal Australian Navy. 1 March 2010. Archived from the original on 13 June 2011. Retrieved 23 December 2012.

- [14] “Royal Australian Navy Ship/Unit Battle Honours” (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.
- [15] “Pirate Buster HMAS Melbourne coming home”. Royal Australian Navy. 17 February 2011. Retrieved 5 April 2011.
- [16] “HMAS Melbourne disrupts pirate attack in Arabian Sea” (Press release). Department of Defence (Australia). 5 January 2011. Retrieved 5 April 2011.
- [17] Australian Associated Press (6 January 2011). “Aussie warship thwarts pirate attack”. *The Sydney Morning Herald* (*smh.com.au*). Retrieved 5 April 2011.
- [18] Australian Associated Press (10 February 2014). “Second major heroin bust for Australian Navy in a week”. *The Brisbane Times*. Retrieved 13 February 2014.
- [19] Rejimon, K (19 February 2014). “\$102m drugs seized from dhow off Oman coast”. *Times of Oman*. Retrieved 19 February 2014.

### 3.6.4 References

#### Books

- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- Jones, Peter (2001). “1972–1983: Towards Self-Reliance”. In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977-78*. *Jane's Fighting Ships* (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.
- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998-99*. *Jane's Fighting Ships* (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.
- Stevens, David (2007). *Strength Through Diversity: The combined naval role in Operation Stabilise* (PDF). Working Papers 20. Canberra: Sea Power Centre - Australia. ISBN 978-0-642-29676-4. ISSN 1834-7231. Retrieved 6 September 2010.

#### Journal articles

- Fish, Tim; Grevatt, Jon (24 June 2008). “Australia's HMAS Toowoomba test fires MU90 torpedo” . *Jane's Navy International* (Jane's Information Group).
- Hooton, E.R. (1 December 1996). “Perking-up the Perry class” . *Jane's International Defence Review* (Jane's Information Group) **9** (9).
- Scott, Richard (12 December 2007). “Enhanced small-calibre systems offer shipborne stopping power” . *International Defence Review* (Jane's Information Group).

## Websites

- “Australia's Hazard(ous) Frigate Upgrade” . *Defense Industry Daily*. Watershed Publishing. 14 January 2008. Retrieved 21 April 2008.
- “HMAS Melbourne (III)”. Royal Australian Navy. Retrieved 24 March 2015.

### 3.6.5 External links

Media related to HMAS Melbourne (FFG 05) at Wikimedia Commons

## 3.7 HMAS Newcastle (FFG 06)

**HMAS Newcastle (FFG 06)**, named for the city of Newcastle, New South Wales, the largest provincial city in Australia, is an *Adelaide*-class guided-missile frigate of the Royal Australian Navy (RAN). The last ship of the class to be constructed, *Newcastle* entered service in 1993. During her career, the frigate has operated as part of the INTERFET peacekeeping taskforce, served in the Persian Gulf, and responded to the 2006 Fijian coup d'état. The frigate is active as of 2016.

### 3.7.1 Design and construction

Main article: *Adelaide*-class frigate

Following the cancellation of the Australian light destroyer project in 1973, the British Type 42 destroyer and the American *Oliver Hazard Perry*-class frigate were identified as alternatives to replace the cancelled light destroyers and the *Daring*-class destroyers.<sup>[1]</sup> Although the *Oliver Hazard Perry* class was still at the design stage, the difficulty of fitting the Type 42 with the SM-1 missile, and the success of the *Perth*-class acquisition (a derivative of the American *Charles F. Adams*-class destroyer) compared to equivalent British designs led the Australian government to approve the purchase of two US-built

*Oliver Hazard Perry*-class frigates in 1976.<sup>\*[1]\*[2]</sup> A third was ordered in 1977, followed by a fourth, with all four ships integrated into the USN's shipbuilding program.<sup>\*[3]\*[4]\*[5]</sup> A further two ships (including *Newcastle*) were ordered in 1980, and were constructed in Australia.<sup>\*[4]\*[5]</sup>

As designed, *Newcastle* had a full load displacement of 4,100 tons, a length overall of 138.1 metres (453 ft), a beam of 13.7 metres (45 ft), and a draught of 24.5 metres (80 ft).<sup>\*[6]\*[7]</sup> Propulsion machinery consists of two General Electric LM2500 gas turbines, which provide a combined 41,000 horsepower (31,000 kW) to the single propeller shaft.<sup>\*[7]</sup> Top speed is 29 knots (54 km/h; 33 mph), with a range of 4,500 nautical miles (8,300 km; 5,200 mi) at 20 knots (37 km/h; 23 mph).<sup>\*[7]</sup> Two 650-horsepower (480 kW) electric auxiliary propulsors are used for close manoeuvring, with a top speed of 4 knots (7.4 km/h; 4.6 mph).<sup>\*[7]</sup> Standard ship's company is 184, including 15 officers, but excluding the flight crew for the embarked helicopters.<sup>\*[7]</sup>

Original armament for the ship consisted of a *Mark 13* missile launcher configured to fire RIM-66 Standard and RGM-84 Harpoon missiles, supplemented by an OTO Melara 76-millimetre (3.0 in) gun and a Vulcan Phalanx point-defence system.<sup>\*[6]\*[7]</sup> As part of the mid-2000s FFG Upgrade Project, an eight-cell *Mark 41* Vertical Launch System was fitted, with a payload of RIM-162 Evolved Sea Sparrow missiles.<sup>\*[8]</sup> For anti-submarine warfare, two *Mark 32* torpedo tube sets are fitted; originally firing the *Mark 44* torpedo, the *Adelaides* later carried the *Mark 46*, then the *MU90 Impact* following the FFG Upgrade.<sup>\*[7]\*[9]</sup> Up to six 12.7-millimetre (0.50 in) machine guns can be carried for close-in defence, and since 2005, two *M2HB* .50 calibre machine guns in *Mini Typhoon* mounts have been installed when needed for Persian Gulf deployments.<sup>\*[7]\*[10]</sup> The sensor suite includes an *AN/SPS-49* air search radar, *AN/SPS-55* surface search and navigation radar, *SPG-60* fire control radar connected to a *Mark 92* fire control system, and an *AN/SQS-56* hull-mounted sonar.<sup>\*[7]</sup> Two helicopters can be embarked: either two *S-70B Seahawk* or one *Seahawk* and one *AS350B Squirrel*.<sup>\*[7]</sup>

*Newcastle* was laid down by AMECON at Williamstown, Victoria on 21 July 1989, launched on 21 February 1992 and commissioned into the RAN on 11 December 1993.<sup>\*[7]</sup> Unlike the first four *Adelaide*-class frigates, *Newcastle* was not constructed in the United States of America, so was never assigned a US Navy hull number.<sup>\*[5]</sup> *Newcastle* is the only *Adelaide*-class ship not named after a state capital city. Instead, she is named after Newcastle, New South Wales, the largest regional city in the country. She is the first ship of the RAN to be named *Newcastle*,<sup>\*[11]</sup> but eight Royal Navy ships have been named *HMS Newcastle*. The Australian *Newcastle* was the first RAN ship not to inherit battle honours awarded to previous British ships of the same name.<sup>\*[12]</sup>

### 3.7.2 Operational history

*Newcastle* was deployed to East Timor as part of the Australian-led INTERFET peacekeeping taskforce from 19 December 1999 to 26 January 2000.\*[13]

During 2005, *Newcastle* was deployed to the Persian Gulf.\*[10] *Newcastle* and **HMAS Parramatta** were the first RAN ships to be fitted with two M2HB .50 calibre machine guns in **Mini Typhoon** mounts; now a standard theatre fit for all RAN frigates deployed to the Persian Gulf.\*[10]

At the start of November 2006, *Newcastle* was one of three Australian warships sent to Fiji during the leadup to the 2006 coup d'état by Fijian military forces against Prime Minister Laisenia Qarase. *Newcastle* was the first vessel on station, and was later joined by **HMAS Kanimbla** and **HMAS Success**. The three vessels were to be used in the event of an evacuation of Australian citizens and nationals.\*[14] It did not prove necessary to conduct an evacuation and *Newcastle* returned to Australia in late December 2006.

On the morning of 13 March 2009, *Newcastle* was one of seventeen warships involved in a ceremonial fleet entry and fleet review in Sydney Harbour, the largest collection of RAN ships since the Australian Bicentenary in 1988.\*[15] The frigate was one of the thirteen ships involved in the ceremonial entry through Sydney Heads, and anchored in the harbour for the review.

Following an overhaul of the RAN battle honours system, completed in March 2010, *Newcastle*'s service was recognised with two honours: "East Timor 1999–2000" and "Persian Gulf 2002–03".\*[16]\*[17] In April 2010, *Newcastle* was presented with the RAN Gloucester Cup, recognising her as the most efficient ship during 2009.\*[18] During July and August 2010, *Newcastle* was one of three RAN ships to participate in the RIMPAC 2010 multinational exercise.\*[19]

### 3.7.3 Citations

- [1] Jones, in Stevens, *The Royal Australian Navy*, p. 220
- [2] Frame, *Pacific Partners*, pp. 102, 162
- [3] Frame, *Pacific Partners*, p. 162
- [4] MacDougall, *Australians at war*, p. 345
- [5] Hooton, *Perking-up the Perry class*
- [6] Moore (ed.), *Jane's Fighting Ships 1977-78*, p. 25
- [7] Sharpe (ed.), *Jane's Fighting Ships 1998-99*, p. 26
- [8] *Australia's Hazard(ous) Frigate Upgrade*, in *Defense Industry Daily*
- [9] Fish & Grevatt, *Australia's HMAS Toowoomba test fires MU90 torpedo*

- [10] Scott, *Enhanced small-calibre systems offer shipborne stopping power*
- [11] "HMAS Newcastle". Royal Australian Navy. Retrieved 11 December 2009.
- [12] Cassells, Vic (2000). *The Capital Ships: their battles and their badges*. East Roseville, NSW: Simon & Schuster. p. 207. ISBN 0731809416. OCLC 48761594.
- [13] Stevens, David (2007). *Strength Through Diversity: The combined naval role in Operation Stabilise* (PDF). Working Papers 20. Canberra: Sea Power Centre – Australia. p. 15. ISBN 978-0-642-29676-4. ISSN 1834-7231. Retrieved 6 September 2010.
- [14] Aussie warships heading for Fiji. *The Daily Telegraph (Australia)*, 2 November 2006.
- [15] Brooke, Michael (2 April 2009). "Marching into History". *Navy News* (Department of Defence).
- [16] "Navy Marks 109th Birthday With Historic Changes To Battle Honours". Royal Australian Navy. 1 March 2010. Archived from the original on 13 June 2011. Retrieved 23 December 2012.
- [17] "Royal Australian Navy Ship/Unit Battle Honours" (PDF). Royal Australian Navy. 1 March 2010. Archived from the original (PDF) on 14 June 2011. Retrieved 23 December 2012.
- [18] "Navy crew set sail on top gongs". *The Daily Telegraph*. 7 April 2010. p. 20.
- [19] Dodd, Mark (6 August 2010). "No-show by subs slammed". *The Australian*. Retrieved 17 August 2010.

### 3.7.4 References

#### Books

- Frame, Tom (1992). *Pacific Partners: a history of Australian-American naval relations*. Rydalmere, NSW: Hodder & Stoughton. ISBN 0-340-56685-X. OCLC 27433673.
- Jones, Peter (2001). "1972–1983: Towards Self-Reliance". In Stevens, David. *The Royal Australian Navy*. The Australian Centenary History of Defence (vol III). South Melbourne, VIC: Oxford University Press. ISBN 0-19-555542-2. OCLC 50418095.
- MacDougall, Anthony Keith (2002) [1991]. *Australians at war: a pictorial history* (2nd (revised and expanded) ed.). Noble Park, Vic: The Five Mile Press. ISBN 1-86503-865-2. OCLC 260099887.
- Moore, John, ed. (1977). *Jane's Fighting Ships 1977-78*. Jane's Fighting Ships (80th ed.). London: Jane's Yearbooks. ISBN 0531032779. OCLC 18207174.

- Sharpe, Richard, ed. (1998). *Jane's Fighting Ships 1998-99*. Jane's Fighting Ships (101st ed.). Coulsdon, Surrey: Jane's Information Group. ISBN 071061795X. OCLC 39372676.

### Journal articles

- Fish, Tim; Grevatt, Jon (24 June 2008). "Australia's HMAS Toowoomba test fires MU90 torpedo". *Jane's Navy International* (Jane's Information Group).
- Hooton, E.R. (1 December 1996). "Perking-up the Perry class". *Jane's International Defence Review* (Jane's Information Group) 9 (9).
- Scott, Richard (12 December 2007). "Enhanced small-calibre systems offer shipborne stopping power". *International Defence Review* (Jane's Information Group).

### Websites

- "Australia's Hazard(ous) Frigate Upgrade". *Defense Industry Daily*. Watershed Publishing. 14 January 2008. Retrieved 21 April 2008.

### 3.7.5 External links

- Australian Defence Force RIMPAC 2010 Images of ESSM / SM2 shoot

## 3.8 Eurocopter AS350 Écureuil

"AStar" redirects here. For the algorithm, see A\* search algorithm. For other uses, see [Astar](#) (disambiguation).

The **Eurocopter AS350 Écureuil** (*Squirrel*) is a single-engine light helicopter originally designed and manufactured in France by [Aérospatiale](#) (now [Airbus Helicopters](#)). In North America, the AS350 is marketed as the **AStar**. The AS355 Ecureuil 2 is a twin-engine variant, marketed in North America as the TwinStar. The Eurocopter EC130 is a derivative of the AS350 airframe and is considered by the manufacturer to be part of the Écureuil single-engine family.\*[2]

### 3.8.1 Development

In the early 1970s, [Aérospatiale](#) decided to initiate a new development program to produce a suitable replacement for the aging [Aérospatiale Alouette II](#). While the [Aérospatiale Gazelle](#), which had been developed in the 1960s and 1970s, had been met with numerous orders by military customers, commercial sales of the type had

been less than anticipated, thus the need for a new civil-orientated development was identified.\*[3]

The development of the new rotorcraft, which was headed by Chief Engineer [René Mouille](#), was focused on the production of an economic and cost-effective aerial vehicle, thus both [Aérospatiale](#)'s Production and Procurement departments were heavily involved in the design process.\*[3] One such measure was the use of a [rolled sheet](#) structure, a manufacturing technique adapted from the automotive industry; another innovation was the newly-developed *Starflex* main rotor. It was also decided that both civil and military variants of the emergent helicopter would be developed to conform with established military requirements.\*[3]

On 27 June 1974, the first prototype, an AS350 C powered by a [Lycoming LTS101](#) turboshaft engine, conducted its maiden flight at [Marignane](#), France; the second prototype, powered by a [Turbomeca Arriel 1A](#), following on 14 February 1975.\*[3]\*[4] The Arriel-powered version, the AS350B, intended for sale throughout the world except for North America, was certified in France on 27 October 1977, while the Lycoming powered AS350C (or AStar) was certified by the US [Federal Aviation Administration](#) on 21 December 1977. In March 1978, deliveries to customers began for the AS350B, deliveries of the AS350C began in April 1978.\*[5]

Over time, the AS350 Écureuil/AStar has received further development; while the aircraft's design remains broadly similar, various aspects and systems such as the [rotor system](#), powerplants, and avionics have been progressively improved. On 6 February 1987, a prototype AS350 B2 flew with a [fenestron](#) tail-rotor in the place of its normal conventional counterpart. On 1 March 1997, the first AS350 B3, equipped with an Arriel 2B engine, performed its first flight.\*[3] Various conversion programs and addons for AS350s have been produced and are offered by multiple third-party 'aftermarket' aerospace firms in addition to those available directly from the type's prime manufacturer. New variants of the Arriel-powered AS350B, the AS350 B1, AS350 B2, and AS350 B3, were progressively introduced; the later B3 differing from preceding models by the increasing use of digital systems, such as the [Garmin](#)-built G500H avionics suite and [FADEC](#) engine control system.\*[6]

Prior to 2013, the type had been manufactured principally at Eurocopter's Marignane facility, near [Marseille](#), France; Eurocopter opted to, as part of a move to disperse its helicopter production activities, begin AS350 production and final assembly activities at its factory in [Columbus](#), Mississippi for deliveries to U.S. commercial helicopter market. The Astar has been Eurocopter's biggest-selling product in the US commercial market, at one point selling roughly one AS350 every business day.\*[7]\*[8] In March 2015, the first Columbus-assembled AS350 B3e received its [FAA](#) certification.\*[9] In December 2015, [Airbus Helicopters](#) reported their in-

tention to double the rate of AS350 production at Columbus in 2016 over the previous year, and that the facility is capable of producing up to 65 AS350s per year.\*[10]

### 3.8.2 Design



Cockpit of an AS350 B2, 2006

The AS350 is a single engine helicopter, powered either by a **Lycoming LTS101** or **Turbomeca Arriel** powerplant (for twin-engined variants, see **Eurocopter AS355**), that drives a three-blade main rotor, which is furnished with a *Starflex* rotor head. The type is well known for its high-altitude performance and has seen frequent use by operators in such environments.\*[6] Both the main and tail rotors make use of composite material and are deliberately designed to minimize corrosion and maintenance requirements.\*[11] The AS350 was also developed to comply with the stringent noise requirements in place in locations such as **national parks**; the in-cabin noise levels are such that passengers may also readily converse during flight. The aircraft can also be quickly started up and shut down, which is often useful during **emergency medical services** roles.\*[11] It is equipped with **hydraulically-assisted flight controls**; these controls remain operational, albeit operated with greater physical difficulty, in the event of a hydraulic failure.\*[12]

Much of the AS350's avionics are provided by **Garmin**, such as the **GI 106A** course-deviation indicator, **GNS 430 VHF/VOR/localizer/glideslope indicator/Global Positioning System** receiver, **GTX 327 Mode A** and **C** transponder, and **GMA 340H** intercom.\*[11] The **Vehicle and Engine Multifunction Display** (VEMD) and the **First Limit Indicator** (FLI) both serve to increase the aircraft's safety during flight, reducing the number of gauges that need to be monitored by the pilot and thereby reducing their workload.\*[13] For increased smoothness in flight, which positively affects passenger comfort as well as safety, stability augmentation systems can be installed. Later-production aircraft feature new avionics and systems such as the integration of an **Automatic Flight Control System** (AFCS) and autopilot, a **glass cockpit** featuring three **LCD displays** and digital avionics, such as

the synthetic-vision terrain mapping system and Airbus's **Multibloc** center console upon which various radios may be mounted.\*[6]\*[14]



AS350 B2, Switzerland, 2006

The AS350 has proven popular in a wide range of roles; as such, multiple cabin configurations can be used, between four and six passengers in a typical seating configuration, and large sliding doors can be fitted to either side of the cabin. In some operators' fleets, the furnishings of the cabin has been designed to enable the internal space and/or equipment fit-out to be rapidly reconfigured to enable aircraft to be switched between diverse operational roles.\*[6] Public service operators, such as those in **law enforcement**, often have **forward looking infrared (FLIR)** cameras and other mission systems installed on their aircraft. Other optional equipment on offer to operators had included **real-time data links**, **rescue hoists**, **underslung cargo hooks**, **electrical external mirrors**, **search lights**, **tactical consoles**, **night vision goggle-compatibility**, **moving-map system**, **internal cabin tie-downs**, **second battery kit**, **sand filters**, **wire strike protection system**, **4-channel radio**, **tail rotor arch**, **cabin floor windows**, and **removable seats**.\*[6]\*[13]

Modern aircraft have various refinements beyond those featuring on older models; these changes include dual-channel FADEC-equipped engines, increasing use of digital avionics in the cockpit, decreased maintenance costs, a re-designed cabin, and a comfortable *Stylenc* interior (optional).\*[6]\*[13] Older aircraft often undergo refurbishment programs to install aftermarket features, or for the addition of functionality common to newer production aircraft, such as **retrofitting** of the glass cockpit.\*[14]

### 3.8.3 Operational history

On 14 May 2005, an AS350 B3 piloted by Eurocopter test pilot Didier Delsalle touched down on the top of **Mount Everest**, at 8,848 m (29,030 ft).\*[15]\*[16]\*[17] this record has been confirmed by the **Fédération Aéronautique Internationale**.\*[18] On 29 April 2010, a stripped-down AS350 B3 rescued three Spanish alpinists, one at a



*French Gendarmerie AS350, 2005*

time, from the slopes of **Annapurna I**, Nepal at an altitude of 6,900 m (22,640 ft); this set a new record for the highest such rescue.\* [19] The record was increased to 7,800 m (25,590 ft), during the rescue of **Sudarshan Gautam** between Camps III & IV in Everest's Yellow Band on the morning of 20 May 2013.\* [20]\* [21]\* [22]\* [23] On 2 June 2014, an AS350 B3e broke a national record in Mexico by successfully landing on the peak of **Pico de Orizaba**, the nation's tallest mountain.\* [24]

The AS350 AStar has been successful in the US market, having become the most popular helicopter platform in use with individual American governmental agencies, law enforcement being a typical use of the type, by 2015.\* [25] By 1999, the AS350 had become the prime helicopter being used by the **United States Customs Service** for light enforcement operations;\* [26] by 2007, the agency had become the single largest operator of the type in the world.\* [27] By 2012, out of the 3,300 AS350s in operation across the world, 783 of them were in service with American-based operators.\* [28]

In the Russian market since 2006, the AS350 and other helicopters built by the manufacturer have been sold and supported by wholly owned subsidiary *Eurocopter Vostok*; UTair Aviation soon emerged as the largest Russian operator of the AS350 B3e with a fleet of at least 20 of the type.\* [29]

In December 2014, **EASA** validation was issued for **Airbus Helicopters China** to conduct training and support activity at their facility in Shenzhen, China; various components of the AS350 (such as the main and tail gearboxes) are now maintained locally.\* [30] On 9 September 2015, China's first helicopter leasing company, CM International Financial Leasing Corp Ltd (CMIFL), placed an order for 100 Ecureuil-series helicopters, these are to be a mix of H125 and H130 helicopters.\* [31]\* [32]

Brazil has been an extensive operator of the AS350; by 2011 more than 300 helicopters were operating in the country in various conditions and roles, including from the flight deck of the Brazilian aircraft carrier **São Paulo**.\* [14]\* [33] Since 1984, the **Brazilian Navy** has used

AS350s to support the **Brazilian Antarctic Program**.\* [34] Helibras, a wholly owned subsidiary of Eurocopter, operates in the country; of the 600 helicopters it had domestically manufactured for the Brazilian market by 2012, 70% were AS350s.\* [35] In January 2011, Helibras signed a contract with the **Brazilian Army** to substantially upgrade and refurbish their existing fleet of 36 AS350 Ecureuils.\* [36]



*AS350 B2, 2001*

In the United Kingdom, the **Defence Helicopter Flying School** has operated 26 AS350, designated *Squirrel HT1*, for the training of pilots of Britain's armed forces; the type was progressively introduced from 1997 onwards as a replacement for the **Aérospatiale Gazelle**.\* [37] In September 2014, the UK's **Ministry of Defence** issued a **request for proposals** to replace the Squirrel HT1; **Airbus Helicopters** has already announced its intention to offer a mixed fleet of **Eurocopter EC130s** and **Eurocopter EC135s** in response.\* [38] Since May 1984, the **Royal Australian Navy's Fleet Air Arm** has operated a fleet of AS350s, these were upgraded to the AS350 BA standard in 1995; the **Royal Australian Air Force** had previously operated the AS350 for training purposes, and briefly for search and rescue missions, but these were later transferred to the **Australian Army**.\* [39]

Between June 2007 and December 2007, the **Danish Air Force** operated a deployment of four AS350 helicopters at **Basra International Airport, Iraq**, to perform liaison and reconnaissance missions in support of coalition forces during the **Iraq War**.\* [40] In June 2015, the **Argentine Defense Ministry** ordered 12 H125s to replace their 1970s era **Aérospatiale SA 315B Lamas** for para-public support missions, such as search and rescue operations, inside Argentina.\* [41]

### 3.8.4 Variants

**AS350 Prototype.**

**AS350 Firefighter** Fire fighting version.

**AS350B** Powered by one **Turbomeca Arriel 1B** engine.

**AS350 B1** Improved version of the original AS350B, which is powered by one Arriel 1D engine, type also fitted with AS355 main rotor blades, AS355 tail rotor with tabs and a tail rotor servo.

**AS350 B2** Higher gross weight version powered by one Arriel 1D1 engine over the B1 version with aerodynamic strake fitted to tail boom along the starboard side and angled engine exhaust duct for better yaw control.

**AS350 B3** High-performance version, is powered by an Arriel 2B engine equipped with a single channel (DECU) Digital Engine Control Unit with a mechanical backup system. This helicopter is the first ever to land on the summit of Mount Everest. AS350 B3/2B1 variant introduces enhanced engine with dual channel (FADEC) Full Authority Digital Engine Control, dual hydraulics and a 2,370 kg (5,225 lb) Maximum Take Off Weight. AS350 B3e (introduced late 2011) equipped with the Arriel 2D engine.

**AS350 BA** Powered by a Arriel 1B engine and fitted with wider chord AS355 main rotor blades and tail rotor servo.

**AS350 BB** AS350 B2 variant selected to meet rotary-wing training needs of UK MoD, through its Defence Helicopter Flying School in 1996. Powered by a derated Arriel 1D1 engine to improve the helicopters' life cycle.

#### Eurocopter Squirrel HT.1

Designation of AS350BB in operation with British Military, through the Defence Helicopter Flying School as a training helicopter.

#### Eurocopter Squirrel HT.2

Designation of AS350BB in operation with British Army Air Corps as a training helicopter, based at Middle Wallop.

**AS350 C** Initial variant of Lycoming LTS-101-600A2 powered version developed for the North American market as the AStar. Quickly superseded by AS350D.

**AS350 D** Powered by one Lycoming LTS-101 engine for the North American market as the AStar. At one stage marketed as AStar 'Mark III.'

**AS350 L1** Military derivative of AS350 B1, powered by a 510kW (684shp) Turbomeca Arriel 1D turboshaft engine. Superseded by AS350 L2.

**AS350 L2** Military derivative of AS350 B2, powered by a 546 kW (732shp) Turbomeca Arriel 1D1 turboshaft engine. Designation superseded by AS550 C2.

**HB350 B Esquilo** Unarmed military version for the Brazilian Air Force. Brazilian designations **CH-50** and **TH-50**. Built under licence by Helibras in Brazil.

**HB350 B1 Esquilo** Unarmed military version for the Brazilian Navy. Brazilian designation **UH-12**. Built under licence by Helibras in Brazil.

**HB350 L1** Armed military version for the Brazilian Army. Brazilian designation **HA-1**. Built under licence by Helibras in Brazil.

#### Aftermarket conversions

**Soley SD1, Super D** AS350 BA powered by an LTS101-600A-3A engine.

**Soley AllStar** AS350 BA powered by a Rolls Royce 250-C30 engine.

**Soley SD2** AS350 B2 powered by an LTS101-700D-2 engine.

**Heli-Lynx 350FX1** AS350 BA powered by an LTS101-600A-3A engine.

**Heli-Lynx 350FX2** AS350 BA or AS350 B2 powered by an LTS101-700D-2 engine.

**Otech AS350BA+** AS350 BA powered by an LTS101-600A-3A engine.\*[42]

#### 3.8.5 Operators

The AS350 is in service around the world operated by private individuals, airline and charter operators, emergency medical teams, governments and law enforcement agencies.

#### Military and government operators



A Canadian AS350 BA AStar

**Algeria**\*[43]



*Los Angeles County Sheriff's Department AS350 B3*



*San Bernardino County Sheriff's Department AS350 B3*



*AS350B-3 Ecureui over Lauberhorn, Switzerland*



*AS.350BB Squirrel HT1 of the (UK) Defence Helicopter Flying School*



*AS350 dipping its bucket into a swimming pool for a water drop on a wildfire near Naples, Italy*

- Algerian Air Force
- Gendarmerie Nationale (Algeria)
- Algerian Police

#### **Argentina**

- Argentine National Gendarmerie<sup>\*</sup> [44]
- Buenos Aires Province Police<sup>\*</sup> [45]

#### **Australia**

- Royal Australian Navy<sup>\*</sup> [46]

#### **Bolivia**

- Bolivian Air Force<sup>\*</sup> [46]

#### **Botswana**

- Botswana Defence Force Air Wing<sup>\*</sup> [46]

#### **Brazil**

- Brazilian Navy<sup>\*</sup> [46]
- Brazilian Air Force<sup>\*</sup> [46]

#### **Cambodia**

- Royal Cambodian Air Force<sup>\*</sup> [47]

 Canada

- Royal Canadian Mounted Police\* [48]

 Central African Republic

- Central African Republic Air Force\* [46]

 Chile

- Chilean Army\* [46]

 France

- National Gendarmerie\* [49]

 Gabon

- Gabonese Air Force\* [46]

 Guinea

- Guinea Air Force\* [46]

 Iceland

- Icelandic Coast Guard\* [50]

 Jordan

- Royal Jordanian Air Force\* [46]

 Malawi

- Malawi Army Air Wing\* [46]

 Mali

- Mali Air Force\* [46]

 Nepal

- Nepalese Army Air Service\* [46]

 Paraguay

- Paraguayan Air Force\* [46]
- Paraguayan Naval Aviation\* [46]

 Philippines

- Philippine National Police\* [51]

 Russia

- Ministry of Defence\* [52]

 South Africa

- South African Police Service\* [53]

 United Kingdom

- Defence Helicopter Flying School\* [54]

 United States

- Customs and Border Protection\* [55]\* [56]
- Los Angeles Police Department\* [57]
- Los Angeles County Sheriff's Department\* [58]
- Baltimore County Police Department\* [59]
- Philadelphia Police Department
- Texas Department of Public Safety
- California Highway Patrol

### 3.8.6 Notable accidents and incidents

- On 14 December 2004 an AS350-B3 medical transport helicopter operated by Air Evac of Arizona crashed on final approach while attempting to land on an emergency scene in Apache Junction, Arizona. Flight Medic Doreen Renee Johnson, 26, was killed on impact. The pilot Susanna Corcoles and Flight Nurse Kelly Foster-Stopka sustained serious but non-life-threatening injuries.\* [60]
- On 27 July 2007, two AS350s collided in mid-air while reporting a police pursuit. The two helicopters were part of KNXV-TV and KTVK television stations in Phoenix, Arizona. Four crew members were killed in this accident.\* [61]

- On 15 September 2007, former World Rally Championship driver Colin McRae and three passengers were killed when his AS350 B2 Squirrel,\*[62] which he was piloting, crashed near Lanark, Scotland.\*[63]\*[64]
- On 8 August 2009, a Piper PA-32R collided with an AS350 over the Hudson River, with both aircraft crashing into the Hudson River. There were no survivors from the crash.
- On 29 April 2011, a Pawan Hans AS350 B-3 helicopter carrying Dorjee Khandu, the Chief Minister of Arunachal Pradesh, and four other people, went missing. It was traced four days later near Lobthang. All five people were found dead
- On 10 June 2012, an AS350 B3e\*[65] belonging to the Kenya Police Air Wing crashed in Kibiku area in Ngong Forest, west of Nairobi, Kenya, killing at least six people, including Kenya's Interior Security Minister George Saitoti and his deputy Orwa Ojode.\*[66]\*[67]
- On 31 March 2013, an AS350 B3 Astar belonging to the Alaska State Troopers crashed\* [68] near Talkeetna, Alaska, killing all three aboard. The helicopter was on a rescue mission to recover an injured snowmobiler. The crash also claimed the life of an Alaska State Trooper.
- On 22 October 2013, an AS350 B3 medical transport helicopter operated by Memphis, Tennessee-based Hospital Wing crashed near Somerville, Tennessee, while en route to Bolivar, Tennessee. Three personnel onboard (one Hospital Wing pilot and the medical team of one flight nurse and one respiratory therapist from Le Bonheur Children's Hospital) were killed in the accident.\*[69]
- On 18 March 2014, an AS350 B2 owned by Helicopters Inc. and being used as a temporary replacement by KOMO-TV and KING-TV in Seattle, Washington, crashed across the street from the Fisher Plaza while attempting to take off from the rooftop of the studios of KOMO. The two people on board, pilot Gary Pfitzner and photographer Bill Strothman, were killed. The sole occupant of a passenger car onto which the helicopter fell was severely burned and taken to Harborview Medical Center. Two additional vehicles caught fire from the burning fuel, but the drivers escaped injury. According to eyewitnesses and security camera recordings, the helicopter yawed 360 degrees and pitched down while attempting to lift off the helipad.\*[70]
- On 7 June 2014, a Helibrás HB-350BA crashed after takeoff, in Aruanã, Goiás state, Brazil. All on board died, including retired soccer player Fernandão.\*[71]
- On 9 March 2015, two AS350B3 collided mid air in La Rioja Province, Argentina, killing all 10 people on board both aircraft. The passengers, including a number of French athletes, were participants in the filming of French reality television program *Dropped*.
- On 2 June 2015, a Mountain Helicopters helicopter (9N-AJP) crashed in a forest in Yamuna village of Sindhupalchok district Nepal, killing at least five people. The helicopter had flown to Sindhupalchok to distribute relief materials to earthquake victims.\*[72]\*[73]
- On 18 November 2015, a AS350 crashed at McClellan–Palomar Airport southeast of Carlsbad in San Diego County, California killing the pilot and one passenger.\*[74]\*[75]
- On 21 November 2015, a New Zealand Alpine Adventures helicopter crashed into a crevasse on Fox Glacier, New Zealand, killing all 7 people on board.\*[76]
- On 23 November 2015, AS350 B3 helicopter owned by Himalayan Heli Services registered VT-JKB crashed after take-off at Katra, Jammu and Kashmir in India, killing 7 people including 6 Vaishno Devi pilgrims and a women pilot.\*[77]\*[78]

### 3.8.7 Specifications (AS350 B3)

*Data from Brassey's World Aircraft & Systems Directory 1999/2000\**[79]

#### General characteristics

- **Crew:** 1
- **Capacity:** 5
- **Length:** 10.93 m\*[80] (35 ft 10½ in)
- **Rotor diameter:** 10.7 m (35 ft 1 in)
- **Height:** 3.14 m (10 ft 3½ in)
- **Disc area:** 89.75 m<sup>2</sup> (966.1 sq ft)
- **Empty weight:** 1,174 kg (2,588 lb)
- **Max. takeoff weight:** 2,250 kg (4,960 lb)
- **Powerplant:** 1 × Turbomeca Arriel 2B turboshaft, 632 kW (847 shp)

#### Performance

- **Never exceed speed:** 287 km/h (155 knots, 178 mph)
- **Cruise speed:** 245 km/h (132 knots, 152 mph)



Forward cabin of an AS355, 2008

- **Range:** 662 km (357 nmi, 411 mi)
- **Endurance:** 4.1 hrs
- **Service ceiling:** 4,600 m (15,100 ft)
- **Rate of climb:** 8.5 m/s (1,675 ft/min)

#### Avionics

Vehicle and Engine Monitoring Display (VEMD) with First Limit Indicator (FLI) fitted as standard.

† 4, 5, & 6 passengers options available.\* [81] The 6 passenger configuration is a relatively uncommon high-density seating option that replaces one front seat with a two-person bench and relocates the pilot to the left side of the cockpit.\* [82]

#### 3.8.8 See also

##### Related development

- Eurocopter AS355
- Eurocopter AS550 Fennec
- Eurocopter EC130
- Changhe Z-11

#### Aircraft of comparable role, configuration and era

- MBB Bo 105
- MD Helicopters MD 500
- Bell 407
- PZL SW-4
- Marenco SKYe SH09

#### Related lists

- List of active United Kingdom military aircraft

#### 3.8.9 References

##### Citations

- [1] "Eurocopter AS350, AS355 & EC130 Technical Briefing.", *Airbus Helicopters*, February 2010.
- [2] Fabre, François et. al., "Final Report: Eurocopter AS350 Ecureuil/Single Engine Family, Revision 4.", *European Aviation Safety Agency*, 8 June 2012.
- [3] "1974: AS350/355 Ecureuil/AStar- AS550/555 Fennec - EC130." *Eurocopter*, Retrieved: 25 December 2015.
- [4] Jackson 2003, p. 244.
- [5] Taylor 1982, p. 56.
- [6] Lombardi, Frank. "AStar Evolution.", *Aviation Today*, 12 May 2015.
- [7] Osborne, Tony. "French Unions Dislike Eurocopter's U.S. AS350 Plan.", *Aviation Week*, 30 September 2013.
- [8] "Eurocopter to assemble AS350 aircraft in Mississippi.", *United Press International*, 23 September 2013.
- [9] "First US-made Airbus Helicopters AS350 certified.", *Aerospace Manufacturing and Design*, 3 March 2015.
- [10] Forrest, Ben. "Airbus aims to ramp up H125 production in Mississippi." *Vertical Magazine*, 22 December 2015.
- [11] Stephens, Ernie, and James T. McKenna. "The AS350 — Versatility and Power.", *Rotor & Wing*, 1 June 2007.
- [12] "AS350: Hydraulics Out? Fly the Procedure.", *Rotor & Wing*, 1 June 2007.
- [13] "Civil: H125." *Airbus Helicopters*, 2015.
- [14] "Eurocopter's Helibras Subsidiary to Modernize 36 AS350 Ecureuil Helicopters Operated by the Brazilian Army Aviation Command.", *Helicopter Maintenance Magazine*, 1 February 2011.
- [15] "Landing on Air". *National Geographic Adventure*. 1 September 2005.
- [16] The Helicopter land on Everest with video

- [17] "French Everest Mystery Chopper's Utopia summit" . MountEverest.net. 27 June 2005.
- [18] "FAI Record ID #11596 – Highest take-off" *Fédération Aéronautique Internationale (FAI)*. Retrieved: 20 September 2014.
- [19] "Helicopter Rescues in Everest's Western CWM?". Retrieved 28 February 2012.
- [20] Bierling, Billi (October 2013). "The height of folly?". Action Asia Magazine. When he fell at the Yellow Band during his descent, Gautam then set another landmark: for the highest helicopter rescue in the world. The Italian pilot Maurizio Folini took on the daring task and used a 'long line' from 7,800 metres to pull the 30-year-old off the mountain. The rescue may also cost Gautam his place in the Himalayan Database as, according to Hawley's criteria, his climb is not complete.
- [21] Arnette, Alan (28 February 2014). "Everest 2014: Can I be Rescued on Everest?".
- [22] Sottocornola, Sara (23 May 2013). "Everest, record superato: incredibile recupero vicino a campo 4 per Maurizio Folini" . montagna.tv (in Portuguese).
- [23] Wright, Brian (10 June 2013). "Daring High Altitude Rescue on Everest Sets Record" . Rock and Ice, The Climber's Magazine.
- [24] "AS350 B3e breaks record on Mexico's highest mountain.", *Vertical Magazine*, 2 June 2014.
- [25] "Several California Law Enforcement Agencies to Use New AStar Model.", *Rotor & Wing*, 3 March 2015.
- [26] "Congressional Record, V. 145, Pt. 11, July 1, 1999 to July 15, 1999.", *Government Printing Office*, pp. 15192-15193. Retrieved 5 June 2015.
- [27] Schmidt-Creton, Vanessa. "Largest Astar Operator in the US.", *Airbus Helicopters*, 12 July 2007.
- [28] "American Eurocopter Celebrates 200th American-Made AS350 Helicopter.", *AviationPros*, 20 September 2012.
- [29] "Eurocopter Vostok Delivers First Enhanced AS350 B3e Helicopters for Utair Aviation, Which Will Become the Largest Ecureuil Operator in Russia and CIS." *Eurocopter*, 12 January 2012.
- [30] "Airbus Helicopters Receives EASA Approval for Joint-Venture Training and Support in China.", *Aviation Today*, 15 December 2014.
- [31] Wen, Wang. "Heli-Expo launches with huge order for Airbus.", *China Daily*, 9 September 2015.
- [32] "China Heli-Expo 2015" (3): Chinese CMIFL sign agreement for 100 H-125/H-130 helicopters over five years., *AvioNews*, 9 September 2015.
- [33] "Zentech to support Brazilian aircraft carrier Sao Paulo's upgrade programme.", *naval-technology*, 7 May 2015.
- [34] Morant, Belen. "The Brazilian Navy: The Ecureuil in Antarctica.", *Rotor Online*, April 2009.
- [35] "Eurocopter Unit Inaugurates Chopper Plant in Brazil.", *defensenews*, 2 October 2012.
- [36] "Elixir of Youth for AS350", *SavunmaSanayi.Net*, 6 January 2011.
- [37] "Squirrel HT1.", *Royal Air Force*. Retrieved 6 June 2015.
- [38] Perry, Dominic. "UK MoD begins training helicopter acquisition.", *Flight International*, 10 September 2014.
- [39] "Navy's 'Battle Budgie' turns 30.", *australianaviation.com.au*, 30 May 2014.
- [40] Ripley 2010, p. 297.
- [41] Guevara, Inigo. "Argentina signs MoU for 12 Airbus Helicopters H125s.", *IHS Jane's Defence Weekly*, 29 June 2015.
- [42] Reyno, Mike, "Power Play" , *Vertical* December 2006
- [43] [http://armstrade.sipri.org/armstrade/page/trade\\_register.php](http://armstrade.sipri.org/armstrade/page/trade_register.php)
- [44] "Ecureuil scores success in South America" . eurocopter.com. Retrieved 17 February 2013.
- [45] "Control and Prevention" . Retrieved 18 December 2012.
- [46] "World Air Forces 2015" . *Flightglobal Insight*. 2015. Retrieved 16 April 2015.
- [47] "World Air Forces 2015 pg. 11" . *Flightglobal Insight*. 2015. Retrieved 26 December 2014.
- [48] "R.C.M.P Helicopter" . Retrieved 26 January 2005.
- [49] "French National Gendarmerie AS350 ecureuil" . Retrieved 17 February 2013.
- [50] "Iceland CG Aircraft" . aeroflight.co.uk. Retrieved 17 February 2013.
- [51]
- [52] Про вертолеты Eurocopter Министерства обороны России
- [53] Eurocopter Southern Africa Archived 6 April 2013 at the Wayback Machine
- [54] "FB Heliservices Ltd. clocks up 250,000 Flight Hours with Eurocopter AS350 BB 'Squirrel' Fleet" . eurocopter.com. Retrieved 17 February 2013.
- [55] "Southwest Border Region/ CPB" . cbp.gov. Retrieved 17 February 2013.
- [56] "CPB AS 350" . Demand media. Retrieved 17 February 2013.
- [57] Why Is That LAPD Helicopter Circling Overhead?
- [58] "LASD Aero Bureau" . code2high.com. Retrieved 3 September 2014.
- [59] <http://www.baltimorecountymd.gov/Agencies/police/aviation1.html>

- [60] “One Killed, 2 Injured When Arizona AirEvac Helicopter Crashes” . Firehouse.com. 14 December 2004.
- [61] [http://www.abc15.com/content/aboutus/bios/story.aspx?content\\_id=cbbf03e0-247b-4b74-be7a-8c199c50d80d](http://www.abc15.com/content/aboutus/bios/story.aspx?content_id=cbbf03e0-247b-4b74-be7a-8c199c50d80d)
- [62] Civil Aviation Authority
- [63] “Colin McRae feared dead in helicopter crash – police” . Yahoo! News/AFP. Retrieved 16 September 2007.
- [64] Rose, Gareth; Watson, Jeremy (16 September 2007). “Rally ace Colin McRae dies in helicopter crash” . *The Scotsman* (Edinburgh). Retrieved 16 September 2007.
- [65] Mukinda, Fred and Silas Apollo. “Chopper was 'new and powerful'”. *Daily Nation*. 10 June 2012. Retrieved 13 June 2012.
- [66] “Kenyan minister George Saitoti killed in helicopter crash” . BBC News. 10 June 2012. Retrieved 10 June 2012.
- [67] “Minister killed in Kenyan helicopter crash” . aljazeera.com. 10 June 2012. Retrieved 10 June 2012.
- [68] “Investigation begins into helicopter crash that killed three.” Anchorage Daily News . 1 April 2013. Retrieved 2 April 2013.
- [69] <http://www.commercialappeal.com/news/2013/oct/22/medical-helicopter-crashes-outside-somerville>
- [70] “WPR14FA137 – Preliminary Accident Report” . 21 March 2014. Retrieved 21 March 2014.
- [71] “Former Brazil and Internacional striker Fernandão dies in helicopter crash” . 7 June 2014. Retrieved 7 June 2014.
- [72] <http://www.nepalitimes.com/blogs/thebrief/2015/06/02/helicopter-crash-in-sindhupalchok/>
- [73] <http://nepaliaviator.com/helicopter-crash-in-sindhupalchowk-leaves-4-dead/>
- [74] <http://www.cbs8.com/story/30553994/two-killed-in-helicopter-crash-at-palomar-airport-identified>
- [75] <http://www.thecoastnews.com/2015/11/19/two-men-killed-in-helicopter-crash/>
- [76] <https://www.rt.com/news/322952-nz-helicopter-crash-glacier/>
- [77] <http://indiatoday.intoday.in/story/helicopter-crash-kills-6-near-katra/1/529355.html>
- [78] [http://www.dgca nic in/caris/know\\_regn.asp?regn=JKB](http://www.dgca nic in/caris/know_regn.asp?regn=JKB)
- [79] Taylor 1999, p. 377.
- [80] Fuselage length
- [81] [http://www.eurocopter.com/site/en/ref/Overview\\_68.html](http://www.eurocopter.com/site/en/ref/Overview_68.html)
- [82] <http://www.trykauai.com/astar-seats.gif>

## Bibliography

- Hoyle, Craig. “World Air Forces Directory”. *Flight International*. Vol 180 No 5321, 13–19 December 2011. pp. 26–52.
- Jackson, Paul. *Jane's All The World's Aircraft 2003–2004*. Coulsdon, Surrey, UK: Jane's Information Group, 2003. ISBN 0-7106-2537-5.
- Ripley, Tim. *Middle East Air Power in the 21st Century*. Casemate Publishers, 2010. ISBN 1-8488-4099-3.
- Taylor, John W. R. *Jane's All The World's Aircraft 1982–83*. London: Jane's Yearbooks, 1982. ISBN 0-7106-0748-2.
- Taylor, Michael J. H. *Brassey's World Aircraft & Systems Directory 1999/2000*. London: Brassey's, 1999. ISBN 1-85753-245-7.

## Further reading

- Croucher, Phil. *The AS 350/355 Book*. Lulu.com, 2014. ISBN 1-92683-319-8.

### 3.8.10 External links

- Eurocopter's AS350 B2 page
- Eurocopter's AS350 B3 page

## 3.9 Mark 41 Vertical Launching System

The **Mark 41 Vertical Launching System (Mk 41 VLS)** is a shipborne missile canister launching system which provides a rapid-fire launch capability against hostile threats.\* [1] The **Vertical Launch System (VLS)** concept was derived from work on the **Aegis Combat System**.\* [2]

### 3.9.1 History

Refinement of the initial concept of Aegis system in the 1960s continued through the 1960s and 1970s, and the Mk 41 was conceived in 1976.\* [2] Originally, the system was only intended to fire the **RIM-66 Standard** missile, but after the **United States Navy** decided that all VLS had to be capable of firing the **Tomahawk** missile, with a consequential increase in the height of the Mk 41 to accommodate the larger missile.\* [2] The prototype for the launcher was tested and evaluated onboard **USS Norton Sound** (AVM-1). The first operational launcher was installed aboard **USS Bunker Hill**.\* [2]

### 3.9.2 Specifications

#### Mark 41

The Mk 41 is capable of firing the following missiles: RIM-66 Standard, RIM-67 Standard, RIM-161 Standard Missile 3, RIM-174 Standard ERAM, Tomahawk, RUM-139 VL-ASROC, RIM-7 Sea Sparrow, and RIM-162 ESSM.\*[2] The missiles are pre-loaded into “canisters”, which are then loaded into the individual “cells” of the launcher. The ESSM is loaded in a quad-pack with 4 missiles in one Mk 25 canister.\*[2] Launcher cells are fitted to ships in 8 cell (2 rows of 4) modules that share a common uptake hatch (exhaust system) sited between the two rows.\*[2] Mk 41 VLS adopts modular design concept, which result in different versions that vary in size and weight due to different “canisters” in various modules. The height (missile length) of the launcher comes in three sizes: 209 inches (5.3 m) for the self-defense version, 266 inches (6.8 m) for the tactical version, and 303 inches (7.7 m) for the strike version. The empty weight for an 8-cell module is 26,800 pounds for the self-defense version, 29,800 pounds for the tactical version, and 32,000 pounds for the strike version.\*[2] Originally, one module would consist of five cells and a collapsible crane for assisting with replenishment at sea, but replenishment of large missiles at sea was later seen as impractical and dangerous, and modules with the cranes fell out of use.\*[2]

#### Mk 57

Mk 57 VLS is the development of Mk 41 VLS. Developed by Raytheon, the primary improvement of Mk 57 GMVLS (guided missile vertical launching system) over Mk 41 is its gas management system that can accommodate new missile designs having up to 45 percent greater rocket motor mass flow rate than that of Mk 41.\*[3]

### 3.9.3 Variants

According to NAVEDTRA 14324, Gunner's Mate, Chapter 7:

- MK 41 Mod 0, Ticonderoga-class cruisers, 61 cells forward and aft\*[4]
- MK 41 Mod 1, Spruance-class destroyers, 61 cells forward\*[4]
- MK 41 Mod 2, Arleigh Burke-class destroyers DDG-51 to DDG-78, 29 cells forward, 61 cells aft.\*[4]
- MK 41 Mod 3, Brandenburg-class frigates, 16 cells.
- MK 41 Mod 5, Anzac-class frigates, 8 cells

- MK 41 Mod 7, Arleigh Burke-class destroyer, DDG-79 to DDG-91, 32 cells forward, 64 cells aft.\*[5]
- MK 41 Mod 8, Barbaros-class frigates, (second pair of ships)
- MK 41 Mod 10, Sachsen-class frigates, 32 cells
- MK 41 Mod 15, Arleigh Burke-class destroyer, DDG-92 and up, 32 cells forward, 64 cells aft.\*[5]
- MK 41 Mod 16, Adelaide-class frigate, 8 cells

### 3.9.4 Mk 41 VLS in use by nations



A *Tomahawk* missile being launched from the Mark 41 Vertical Launching System aboard United States Navy destroyer *USS Farragut*

#### Australia

- *Adelaide*-class frigate - (8 cells)
- *Anzac*-class frigate - (8 cells)
- *Hobart*-class destroyer - (48 cells)

#### Canada

- *Iroquois*-class destroyer - (29 cells)

#### Denmark

- *Iver Huitfeldt*-class frigate - (32 cells)

#### Germany

- *Sachsen*-class frigate - (32 cells)
- *Brandenburg*-class frigate - (16 cells)

### ● Japan

- *Atago*-class destroyer - (96 cells)
- *Kongō*-class destroyer - (90 cells)
- *Hyūga*-class helicopter destroyer - (16 cells)
- *Murasame*-class destroyer - (16 cells)
- *Takanami*-class destroyer - (32 cells)
- *Akizuki*-class destroyer - (32 cells)

### ■ Netherlands

- *De Zeven Provinciën*-class frigate - (40 cells)

### ■ Norway

- *Fridtjof Nansen*-class frigate - (8 or 16 cells)

### ■ New Zealand

- *Anzac*-class frigate - (8 cells)

### ■ South Korea

- *Chungmugong Yi Sun-shin*-class destroyer (KDX-II) - (32 cells)
- *King Sejong the Great*-class destroyer (KDX-III) - (80 cells)

### ■ Spain

- *Álvaro de Bazán*-class frigate - (48 cells)

### ■ Thailand

- *Naresuan*-class frigate - (8 cells)

### ■ Turkey

- G class frigate - (8 cells)
- *Barbaros*-class frigate - (16 cells)

### ■ United States of America

- *Spruance*-class destroyer - (61 cells, installed on 24 of 31 vessels)
- *Arleigh Burke*-class destroyer - (96 cells)
- *Ticonderoga*-class cruiser - (122 cells)

## 3.9.5 Gallery

- The VLS cells on board USS *San Jacinto*.
- A Tomahawk missile canister being loaded into a VLS aboard the *Arleigh Burke* class destroyer USS *Curtis Wilbur*
- VLS cells open for inspection aboard USS *Fitzgerald*
- An SM3 departs the Mk 41 VLS aboard USS *Lake Erie* with uptake hatch and cell hatch open.
- VLS Strikedown crane folded, aboard USS *Mitscher*
- VLS Strikedown crane extended, aboard USS *Hopper*
- Diagram of a Mk 41 Mod 0 VLS.

## 3.9.6 See also

- Vertical launching system
- Sylver Vertical Launching System - a competitor to the MK 41 VLS

## 3.9.7 References

- [1] “Mark 41 Vertical Launching System” . Retrieved 21 September 2011.
- [2] Friedman, Norman (2006). *The Naval Institute Guide to World Naval Weapon Systems* (5th ed.). Annapolis, MD: Naval Institute Press. p. 600.
- [3] Mk 57
- [4] NAVEDTRA 14324, Gunner's Mate, Chapter 7.
- [5] U.S. Navy Guided Missile Launcher Systems Accessed May 15, 2014.

## 3.9.8 External links

- FAS - Mk 41
- Lockheed Martin - Mk 41 VLS Factsheet

# Chapter 4

## Spanish Navy

### 4.1 Santa María-class frigate

The **Santa María** class of frigates is the Spanish Navy's designation for six locally built warships based on the United States *Oliver Hazard Perry*-class frigates.

Built in two batches, the second batch units (F-85 and 86) received some improvements, such as an improved combat-data system, updated SPS-49 and SQR-19 sets, and a new **Meroka** mount. The Mk92 Mod 6 CORT replaced the previous Mod 4, providing better capabilities against sea-skimming missiles. The electronic warfare suite was also updated.

Spanish ships have a slightly bigger beam and were built with a greater weight reserve for future improvements. Other changes from the basic model include Meroka replacing Phalanx and a RAN-12L air search radar to provide low horizon coverage against sea skimmers cueing the Meroka CIWS mount. The Nettunel EW suite (based on the Italian Nettuno built in Spain) replaced the SLQ-32 system fitted aboard US ships.

The class is currently receiving a mid-life update (MLU), including a new EW suite, improved combat-data system, an upgrade of the Mk92 FCS, new electrical generators, the removal of the SQR-19 TACTASS towed array and habitability improvements. Four ships have already been modernized.

#### 4.1.1 Units of class

- SPS *Santa María* (F81)
- SPS *Victoria* (F82)
- SPS *Numancia* (F83)
- SPS *Reina Sofía* (F84)
- SPS *Navarra* (F85)
- SPS *Canarias* (F86)

All are homeported in Rota, Spain.

#### 4.1.2 External links

- MaritimeQuest Oliver Hazard Perry Class Overview
- BUQUESDEGUERRA.TK, a Spanish website about warships
- 

### 4.2 Spanish frigate Santa María (F81)

**SPS Santa María (F81)** is the lead ship of six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry* class design, of the Spanish Navy.

Laid down on 22 May 1982 and launched on 11 November 1984, the *Santa María* was commissioned into service on 12 October 1986.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

#### 4.2.1 Other units of class

- *Victoria* (F82)
- *Numancia* (F83)
- *Reina Sofía* (F84)
- *Navarra* (F85)
- *Canarias* (F86)

### 4.3 Spanish frigate Victoria (F82)

**SPS Victoria (F82)** is the second of the six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry* class design, of the Spanish Navy.

Laid down on 16 August 1983, and launched on 23 July 1986, *Victoria* was commissioned in service on 11 November 1987.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

On 29 March 2009, as she was taking part in *Operation Atalanta*, German Navy tanker *Spessart* was attacked by a 7-man pirate boat.\* [1]\*[2] In addition to the regular 40-man civilian crew, *Spessart* carried a 12-man security detail which exchanged small arm fire with the pirates, and repelled the assault.\* [3] The SH-60 helicopter aboard *Victoria* intercepted the fleeing pirate skiff, opened fire and kept guard over the surrendering pirates until relieved by naval units. Fellow warships *HNLMS De Zeven Provinciën*, *Psara* and *USS Boxer* were also involved in this chase.

On 2 June 2010, *Victoria* provided medical assistance to the crew of the Libyan vessel MV *Rim*, and prevented re-capture of that ship by Somali pirates, after the crew of MV *Rim* overpowered the pirates who had hijacked the ship four months earlier. MV *Rim* had been anchored in the harbor of Garacad, Somalia, since her 3 February 2010 taking in the Gulf of Aden. On 3 August 2010, a helicopter from *Victoria* stopped a pirate attack on the Norwegian chemical tanker MV *Bow Saga*, which had sent a distress call that it was under attack by a pirate skiff. The seven pirates on board the skiff were later captured by a second team from the European Union naval force in the region.\* [4]

On 3 August 2010, the Norwegian chemical tanker MV *Bow Saga* was proceeding through the transit corridor in the middle of the Gulf of Aden when it came under attack. A pirate skiff with 7 people on board shot at the bridge, damaging the windows. EU NAVFOR heard her distress call and ordered the closest warship, the Spanish frigate SPS *Victoria* react to the incident. *Victoria* already had her helicopter in the air and was able to intervene only ten minutes after the call. The pirates stopped the attack and tried to flee. After warning shots, first from the helicopter and then from the warship *Victoria*, the pirates eventually stopped. The skiff was searched by a boarding team from *Victoria* and weapons were subsequently found.\* [5]

### 4.3.1 Other units of class

- *Santa María* (F81)
- *Numancia* (F83)
- *Reina Sofía* (F84)
- *Navarra* (F85)
- *Canarias* (F86)
- *Santa María* (F81)
- *Victoria* (F82)
- *Reina Sofía* (F84)
- *Navarra* (F85)
- *Canarias* (F86)

### 4.3.2 References

- [1] Gros-Verheyde, Nicolas (30 March 2009). “Erreur fatale: les pirates attaquent un navire... d’Atalanta!” (in French). Bruxelles 2. Retrieved 17 November 2014.
- [2] Perry, Tom (30 March 2009). “GULF OF ADEN: Pirates fire on German ship, leading to five-hour chase”. *Babylon and Beyond*. Los Angeles Times. Retrieved 17 November 2014.
- [3] “Deutsche Marine setzt Angreifer vor Somalia fest” (in German). Frankfurter Allgemeine. 31 March 2009. Retrieved 17 November 2014.
- [4] “Crew ‘seizes back’ ship from Somali pirates” . *BBC News*. 2 June 2010. Retrieved 17 November 2014.
- [5] “EU NAVFOR warship SPS VICTORIA apprehends pirate attack skiff”. *EU NAVFOR*. 3 August 2010. Archived from the original on 6 August 2010.

### 4.3.3 External links

- Video of fleeing pirate skiff from *Spessart* incident under helicopter fire

## 4.4 Spanish frigate Numancia (F83)

**SPS Numancia (F83)** is the third of the six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry* class design, of the Spanish Navy.

Laid down on 8 January 1986, and launched on 29 January 1987, *Numancia* was commissioned in service on 17 November 1989.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

On 27 April 2009 *Numancia* seized the 9 somali pirates that tried to board *MSC Melody*.\* [1]

### 4.4.1 Other units of class

- *Santa María* (F81)
- *Victoria* (F82)
- *Reina Sofía* (F84)
- *Navarra* (F85)
- *Canarias* (F86)

#### 4.4.2 References

- [1] “La fragata española 'Numancia' apresa a 9 piratas somalíes acusados de atacar un crucero italiano” (in Spanish). rtve.es. 27 April 2009. Retrieved 17 November 2014.

### 4.5 Spanish frigate Reina Sofía (F84)

**Reina Sofía (F84)** is the fourth of six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry*-class design, of the Spanish Navy.

Laid down on 12 October 1987, and launched on 19 July 1989, *Reina Sofía* was commissioned in service on 30 October 1990. She is named for Queen Sofía of Spain.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

#### 4.5.1 Other units of class

- *Santa María* (F81)
- *Victoria* (F82)
- *Numancia* (F83)
- *Navarra* (F85)
- *Canarias* (F86)

### 4.6 Spanish frigate Navarra (F85)

**SPS Navarra (F85)** is the fifth of the six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry*-class design, of the Spanish Navy.

Laid down on 15 April 1991, and launched on 23 October 1992, *Navarra* was commissioned in service on 27 May 1994.

The ship features a series of improvements to her previous sisters, with a new Meroka mod 2B CIWS, and upgraded fire control systems with Mk.92 mod6 CORT (Coherent Receiver Transmitter) and SPS-49(v)5 radar instead of previous (v)4.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

#### 4.6.1 Operational Service

On 9 December 2002, *Navarra* intercepted the unflagged freighter *So San* several hundred miles southeast



So San assault

of Yemen at the request of the United States government as part of Operation Enduring Freedom - Horn of Africa. The frigate fired across *So San*'s bow after the freighter ignored hails and attempted to evade the frigate. The freighter's crew was North Korean; 23 containers containing 15 complete Scud ballistic missiles, 15 high-explosive warheads, and 23 nitric acid containers were found on board. Yemen claimed ownership of the shipment and protested the interception and U.S. officials released the vessel after receiving assurances that the missiles would not be transferred to a third party.\*[1]\*[2] On 23 March 2010, she sank a Somali pirate mothership lifeboat and captured two skiffs,\*[3] after private security forces successfully defended MV *Almezaan* from a pirate attack.\*[4] The six suspected pirates were later released, when the master and crew of *Almezaan* refused to testify.\*[5]

#### 4.6.2 Other units of class

- *Santa María* (F81)
- *Victoria* (F82)
- *Numancia* (F83)
- *Reina Sofía* (F84)
- *Canarias* (F86)

#### 4.6.3 See also

Action of 25 March 2010

#### 4.6.4 References

- [1] “Scud affair draws US apology” . BBC news. 12 December 2002. Retrieved 17 November 2014.
- [2] “U.S. lets Scud ship sail to Yemen” . CNN.com. 12 December 2002. Retrieved 17 November 2014.

- [3] “La ‘Navarra’ intercepta dos esquifes y un barco nodriza” (in Spanish). Spanish MoD release. 23 March 2010. Retrieved 17 November 2014.
- [4] “Pirate’ dies as ship’s guards repel attack off Somalia” . BBC News. 24 March 2010. Retrieved 24 March 2010.
- [5] “EU force frees Somali ‘pirates’”. BBC News. 25 March 2010. Retrieved 17 November 2014.

## 4.7 Spanish frigate *Canarias* (F86)

**SPS *Canarias* (F86)**, is the last of the six Spanish-built *Santa María*-class frigates, based on the American *Oliver Hazard Perry*-class design, of the Spanish Navy.

Laid down on 15 April 1992, and launched on 21 June 1993, *Canarias* was commissioned in service in 1995.

The ship features a series of improvements to her previous sisters, with a new **Meroka mod 2B CIWS**, and upgraded fire control systems with Mk.92 mod6 CORT (Coherent Receiver Transmitter) and **SPS-49(v)5** radar instead of previous (v)4.

All of these Spanish frigates have the length of the later *Oliver Hazard Perry* frigates, and have a wider beam than the US Navy design, and therefore able to carry more top weight. Fin stabilizers are fitted.

### 4.7.1 Other units of class

- *Santa María* (F81)
- *Victoria* (F82)
- *Numancia* (F83)
- *Reina Sofía* (F84)
- *Navarra* (F85)

## 4.8 Meroka CIWS

The **Meroka CIWS** is a Spanish Navy 12 barrelled 20 mm CIWS, using twelve Oerlikon 20 mm/120 guns mounted in 2 rows of 6 guns each. The system's primary purpose is defence against anti-ship missiles, and other precision guided weapons. However it can also be employed against aircraft, ships and other small craft, coastal targets, and floating mines. The weapon is mounted primarily on Spanish naval vessels, from frigate size upwards.

The term MeRoKa (from German *Mehrrohrkanone*, meaning *multi-barrelled gun*) can refer to weapons such as the **Nordenfelt gun** but is more commonly used referring to this naval CIWS defence system. The “Meroka” was developed and produced by the Spanish firm **FABA** (*Fábrica de Artillería Bazán*).



*Meroka on Spanish aircraft carrier Príncipe de Asturias (R-11)*

### 4.8.1 Description

Unlike a **Gatling gun**, the **Meroka CIWS** uses individual guns firing in salvos or simultaneously; the barrels are purposely skewed in order to expand the impact area. The guns are mounted in an enclosed automatic **turret** and are directed by radar or an optronic thermal controlling system.

The original version of the Meroka CIWS was directed by a separate off-mount radar system. This was later changed to an on-mount Lockheed Electronics PVS-2 Sharpshooter I-band radar. The **radar** is designed to acquire targets at 5,500 yards (5,000 meters), with the Meroka achieving first impact at 1,640 yards (1,500 meters) and destruction of the target at 550 yards (500 meters). Later versions included an optronic targeting system, as a backup in high **electronic jamming** conditions. More recent modifications included an **Israeli** designed IR tracker and other electronic devices of Spanish design supplied by **Indra Sistemas**.

### 4.8.2 Specifications

- **Gun:** 12 × Oerlikon 20 mm/120.
- **Weight:** 4,500 kg (9,900 lb).
- **Elevation:**  $-15^\circ$  to  $+85^\circ$ .
- **Traverse:**  $360^\circ$ .
- **Muzzle velocity:** 1,290 m/s (4,200 ft/s).
- **Rate of fire:** 1,440 rounds per minute cyclic (for all twelve barrels).
- **Ammunition:** Fixed (APDS-T) 720 rounds in a magazine, 60 rounds per barrel.
- **Weapons range:** Effective range with APDS-T (0.102 kg with sabot), roughly 1,500–2,000 meters.

- **Search and track systems:** Lockheed Electronics PVS-2 Sharpshooter I-band radar, Indra Thermal Imager.

#### **4.8.3 See also**

- Gast Gun
- Phalanx CIWS
- Volley gun

#### **4.8.4 References**

Naval Weapons of the World

#### **4.8.5 External links**

- Spanish CIWS System Meroka (Spanish)

# Chapter 5

## Republic of China (Taiwan)

### 5.1 Cheng Kung-class frigate

The *Cheng Kung-class* frigates are guided-missile frigates (FFG) currently in service of the Republic of China (Taiwan) Navy (ROCN). They are based upon the U.S. *Oliver Hazard Perry* classs and built by China Shipbuilding Corporation in Kaohsiung, Taiwan under license throughout the 1990s as parts of the “Kuang Hua One” patrol frigate, guided project. These frigates served as the mainstay of the ROCN's theater air defense prior to the ROCN's acquisition of *Keelung (Kidd)*-class destroyers in 2005.

#### 5.1.1 Design

In order to control the new weapon systems on the frigates, which Mk 92 could not integrate at the time, a second CDS, H930 MCS was installed in order to control the 8 HF-2 (or four HF-2 and four HF-3 on certain ships) and the two Bofors 40mm/L70 guns. However, the Mk 92's Harpoon mode was deleted due to the US government refusal to sell the Harpoon missile system to Taiwan at the time. Also deleted were some of Mk 92's ASW modes, along with the refusal to sell SQR-19 Towed Array sonar system.

Originally only two lead ships were going to be built to this standard, the rest of the six ships in the class were going to be built under ACS (Advance Combat System) project with a lighter AEGIS (that later became **SPY-1F**), 48-64 cell **Mark 41 Vertical Launch System** and other systems, and a 15 metres (49 ft) plug-in section. Delay in the design and budget changed the project to four ships in PFG-1101 configuration and the last four ships in ACS configuration, then more delays changed to 6+2, then 7+1. By the mid 1990s, the ROCN decided the ACS project was too risky, too long and too over budget, finally canceling it after the seventh ship was built to the PFG-1101 standard. However, enough of the long lead items were already purchased so that in late 2000, the ROCN decided to go ahead with the eighth ship's construction with PFG-1101 configuration—minus the two Bofors 40mm/L70 guns, after getting necessary funding.

#### 5.1.2 Upgrades



ROCS Tzu I (子儀, PFG-1107)

The *Cheng Kung* class was initially fitted with 8 × *Hsiung Feng II* ship-to-ship missiles, instead of the *Harpoon* missiles that the *Oliver Hazard Perry* class used. In 2001, ROCS *Cheng Kung* (成功, PFG-1101) was refitted with four *Hsiung Feng III* missiles, replacing four of the *Hsiung Feng II* missiles. In 2009 ROCS *Chi Kuang* (繼光, PFG-1105) was seen with same configuration. All the other ships in the class received the new missile upon their major overhaul.

Originally, all HF-2 missiles were to be removed, while 4-8 Harpoon were to be carried in the Mk 13 launcher's magazine (with the necessary upgrade to the ship's Mk 92 CDS which had a Harpoon control mode and functionality deleted when ship was built), and 8 HF-3 supersonic AShM to put in place of 8 HF-2 AShM, giving these ships a total of 12-16 anti-ship missiles. But the Legislative Yuan refused to release funding for the CDS upgrade, and the ROCN had to settle for just 4 HF-2 and 4 HF-3 configuration. All ships had the Link 16 datalink installed.

Seven out of eight ships added Bofors 40 mm/L70 guns for both surface and anti-air use.

In 2014, the Republic of China Navy revealed plan to develop a naval air defense missile system derived from the land-based *Sky Bow* system. The *Cheng Kung*-class

frigates are speculated to be one of the potential platforms to carry the system.

On November 5, 2012 Taiwan announced the U.S. government would sell Taiwan two additional Perry-class frigates that are about to be retired from the U.S. Navy for a cost of US\$240 million to be retrofitted and delivered in 2015. Naval Vessel Transfer Act of 2013 was signed by President Obama in 2014, allowing up to four of the frigates to be sold to Taiwan. These ships would replace aging Chiyang class vessels that joined the Taiwanese Navy close to 50 years ago.

### 5.1.3 Ships

The *Cheng Kung*-class frigates are named after historical Chinese generals who were famous for defeating foreign threats.

### 5.1.4 See also

- - Frigate
  -  - Absalon-class frigate
  -  - F100-class frigate
  -  - *Thetis*-class ocean patrol vessel

### 5.1.5 External links

- GlobalSecurity.org Article
- Cheng Kung Class Frigates, Taiwan

## 5.2 ROCS Cheng Kung (FFG-1101)

**ROCS *Cheng Kung*** (成功, FFG-1101) is the lead ship of eight *Cheng Kung*-class guided-missile frigates, which are based on the *Oliver Hazard Perry*-class of United States Navy. Laid down on 2 December 1990 and launched on 27 October 1991, *Cheng Kung* was commissioned in service on 7 May 1993. All of these Taiwanese FFG's have the length of the later long hull *Oliver Hazard Perry* FFG's, but have a different weapon and electronics fit.

In order to control the different weapon systems on board that the Mk 92 can't integrate into, a second CDS, H930 MCS was installed on all 8 ships in order to control the 8 HF-2(or 4 HF-2 and 4 HF-3 on PFG-1101 and PFG-1105) and the 2 x Bofors 40mm/L70 guns(except on PFG-1110). Rest of the ships in this class will receive 4 HF-3 upon their major overhaul.

### 5.2.1 Namesake

***Cheng Kung*** is named after **Cheng Ch'eng-kung** (鄭成功) (1624 - 1662), who was a military leader at the end of Ming Dynasty that led the recovery of Taiwan from Dutch colonial occupation in 1662.

## 5.3 ROCS *Cheng Ho* (FFG-1103)

**ROCS *Cheng Ho*** is the second of eight Taiwanese-built *Cheng Kung*-class frigates of the Republic of China Navy, based on the *Oliver Hazard Perry* class. Laid down on 21 December 1991 and launched on 15 October 1992, *Cheng Ho* (鄭和) was commissioned in service on 28 March 1994. All of these Taiwanese FFG's have the length of the later *Oliver Hazard Perry* FFG's, but have a different weapon and electronics fit.

### 5.3.1 Namesake

***Cheng Ho*** is named after **Cheng Ho** (鄭和) (1371 - 1433), who was a mariner and explorer in the Ming Dynasty that led several expeditions in early 15th century visiting places on the coasts of Indian Ocean and reached as far west as the African coast.

## 5.4 ROCS *Chi Kuang* (FFG-1105)

***Chi Kuang*** was the third of eight Taiwanese-built frigates based on the *Oliver Hazard Perry*-class. Laid down on 4 October 1992 and launched on 27 September 1993, *Chi Kuang* (繼光) was commissioned in service on 7 March 1995. All of these Taiwanese FFG's have the length of the later *Oliver Hazard Perry* FFG's, but have a different weapon and electronics fit.

### 5.4.1 Namesake

***Chi Kuang*** was named after Ch'i Chi-kuang (戚繼光) (1528 - 1588), who was a famous general of the Ming Dynasty that led numerous successful defenses of China's coast against Japanese pirate attacks and later also led the successful reinforcement work on the Great Wall of China.

## 5.5 ROCS *Yueh Fei* (FFG-1106)

**ROCS *Yueh Fei*** (岳飛, FFG-1106), is a *Cheng Kung*-class guided-missile frigate of the Republic of China Navy. *Yueh Fei* was laid down on 5 September 1992 by the China SB Corp., in Kaohsiung City, Taiwan, launched

on 26 August 1994, and commissioned in February 1996. She is the **fourth** ship of the *Cheng Kung*-class frigates.

As of 2005, *Yueh Fei* is home ported at ROCN Tso-Ying naval base.

### 5.5.1 Namesake

*Yueh Fei* is named after **Yueh Fei** (岳飛) (1103–1142), who was a famous general of the Southern Song Dynasty. He was famous for leading numerous successful defenses of the Southern Song Dynasty against invasions of the Jurchen Jin Dynasty from north.

## 5.6 ROCS Tzu I (FFG-1107)

**ROCS Tzu I** (子儀, FFG-1107) is the fifth of eight Taiwanese-built *Cheng Kung*-class frigates of the Republic of China Navy, based on the *Oliver Hazard Perry* class. Laid down on 7 August 1994 and launched on 13 July 1995, *Tzu I* was commissioned in service in January 1997. The *Cheng Kung*-class frigates have the same length as the later *Oliver Hazard Perry* frigates, but have a different weapon and electronics fit.

Like her sister ships, *Tzu I* was built under license by China SB Corp. at Kaohsiung City, Taiwan, ROC.

As of 2005, *Tzu I* is homeported at Tso-Ying naval base.

### 5.6.1 Namesake

*Tzu I* is named after Kuo Tzu-I (郭子儀) (697 - 781), a famous general of the Tang Dynasty. He was famous for ending the Anshi Rebellion, and leading expeditions against the Huihe (Uyghurs) and Tubo (Tibetans) incursions into Tang territory.

## 5.7 ROCS Pan Chao (FFG-1108)

**ROCS Pan Chao** (班超, FFG-1108) is the sixth of eight Taiwanese-built *Cheng Kung*-class frigates of the Republic of China Navy, based on the *Oliver Hazard Perry* class. Laid down in July 1995 and launched in May 1996, *Pan Chao* was commissioned in December 1997. All of these Taiwanese FFG's have the length of the later *Oliver Hazard Perry* FFG's, but have a different weapon and electronics fit.

Like her sister ships, *Pan Chao* was built under license by China SB Corp. at Kaohsiung City, Taiwan, ROC.

As of 2005, *Pan Chao* is homeported at Tso-Ying naval base.

### 5.7.1 Namesake

*Pan Chao* is named after Pan Chao (班超) (32 - 102), who was a Chinese general and cavalry commander in charge of the administration of the “Western Regions” (Central Asia) during the Eastern Han Dynasty. He was famous for repelling the Xiongnu and secured Chinese control on the Tarim Basin region.

## 5.8 ROCS Chang Chien (FFG-1109)

**ROCS Chang Chien** (張騫, FFG-1109) is the seventh of eight Taiwanese-built *Cheng Kung*-class frigates based on the United States *Oliver Hazard Perry* class. Laid down in June 1996 and launched in April 1997, *Chang Chien* was commissioned in November, 1998. All of these Taiwanese frigates have the length of the later *Oliver Hazard Perry*-class vessels, but have a different weapon and electronics fit.

Like her sister ships, *Chang Chien* was built under license by China SB Corp. at Kaohsiung City, Taiwan, ROC.

As of 2005, *Chang Chien* is homeported at Tso-Ying naval base.

### 5.8.1 Namesake

*Chang Chien* is named after Chang Chien (張騫) (195 BCE - 114 BCE), who served as an emissary to the nation-states in today's Central Asia and later as a general for the Han Dynasty. He was famous for not-giving up his emissary mission even when captured by Xiongnu and forced to live among them for many years. Chang Chien was also instrumental for eventual Han conquest and colonization of the region now known as Xinjiang.

### 5.8.2 Notes

[1] Saunders 2002, p. 691.

### 5.8.3 References

- Saunders, Stephen. *Jane's Fighting Ships 2002–2003*. Coulsdon, UK: Jane's Information Group, 2002. ISBN 0710624328.

## 5.9 ROCS Tian Dan (FFG-1110)

**ROCS Tian Dan** (田單, PFG-1110) is the eighth ship of the *Cheng Kung*-class guided-missile frigates of the Republic of China Navy, which was based on the *Oliver Hazard Perry* class of the United States Navy. *Tian Dan*

was laid down in December 2001, launched on 17 October 2002, and commissioned on 11 March 2004.

The relatively large time gap between the construction of *Tian Dan* and the previous *Cheng Kung*-class frigate, *Chang Chien*, can be accounted by that *Tian Dan* was not intended to be of the standard *Cheng Kung* design. Initially, the design of *Tian Dan* was going to be modified to fit a lighter version of AEGIS that later became SPY-1F, and the drawings looked very much like the Spanish Navy *Álvaro de Bazán* (F-100) class frigates. However, due to uncertain risks at the time, such as the need for ROCN to bear the full cost of the SPY-1F design, and concerns of putting such a system on such a small hull, forced ROCN to abandon this ambitious plan by mid 1990s. The original plan called for three more SPY-1F AGEIS type frigates, in addition to *Tian Dan*. *Álvaro de Bazán* can be seen as a realization of this plan with SPY-1F system.

Like her sister ships, *Tian Dan* was constructed by China SB Corp., at its primary shipyard in Kaohsiung City, Taiwan, Republic of China. But this ship is different from her sister ships by not having the two Bofors 40mm/L70 guns installed. *Tian Dan* is named after *Tian Dan*, a general of the Warring States period.

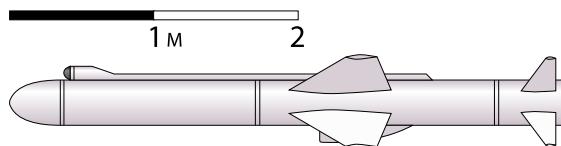
As of 2006, *Tian Dan* is home ported at ROCN Tso-Ying naval base.

On March 14, 2014, *Tian Dan*, along with two of Taiwan's Coastguard patrol vessels, arrived in the South China Sea between Malaysia and Vietnam to join the multi-national search and rescue operation for the missing Malaysia Airlines MH370 flight.

### 5.9.1 See also

- Republic of China Navy

## 5.10 Hsiung Feng II



The **Hsiung Feng II (HF-2)** (雄風二型, “Brave Wind II”) is an anti-ship missile system developed by the Chungshan Institute of Science and Technology in Taiwan. The HF-2 is designed to be deployed aboard ships or at facilities on land, an airborne version has also been developed which can be carried by the ROC Air Force's F-CK fighters. The HF-2 has ECCM capabilities and is deployed on the ROC Navy's *Cheng Kung* class frigates and *Lafayette* class frigates, as well as at several



*Hsiung Feng II Anti-Ship Missile Display in Chengkungling.*

land-based sites. In 2000, plans were announced to replace the HF-2 missiles stationed on the *Cheng Kung* frigates with the RGM-84 Harpoon, but the budget for this was cancelled.

In 2001 a land attack cruise missile variant known as the HF-2E was announced, mass production of the HF-2E began in 2005.

### 5.10.1 Versions

There are three major versions of HF-2 in service. The first to enter service is the ship-based HF-2, with 2 twin box launcher on destroyer DD-915 first as trial vessel. Later all major surface combatant in RoCN, except the Knox, were equipped with 2 quad-launchers, plus the 7 WWII era Gearing DDGs that was upgraded to WC3 standard, from late 1980s to mid 1990s, had added a 1 quad-launcher by mid 1990s to give those air defense ships an anti-surface ability.

Air-launched version appeared in the early 1990s. Carried by two AT-3B trainer/attacker and a single A-3 attacker, the small force poses little threat to the marine intruders due to its small quantity. However, the recent upgraded IDF (F-CK-1C/D) will add the capacity to carry and launch the HF-2, thus greatly enhance the air-to-surface capacity of RoCAF in future. The air launcher version of HF-2 carried by AT-3 is different from the one supposed carried by original IDF (F-CK-1A/B) prototype, due to differences in length of the HF-2 missile (better known as HF-2 Mark 3 and Mark 4), where the missile designed for one aircraft cannot fit on another aircraft. Unknown if air-launched HF-2 program is continuing at this point.

The land-launch version of the HF-2 is the most secretive one, because its relation with the land-attack version of HF-2E. Fixed base versions were produced first, and all major outlying islands of Taiwan were equipped with fortified HF-2 bases in late 1990s, replacing old HF-1 bases. Fixed HF-1 bases in the main island was also be-

ing replaced with fixed HF-2 launchers, again in fortified positions.

The mobile launcher version was accepted in 2005 and went to mass production in 2006. All mobile launchers, together with mobile command center (with data-link), mobile surface search radar and mobile electric generators, were kept in harden shelters and being driven out when needed. The HF-2 mobile launchers, shown in 10-10-2007 parade, was designed to be able to carry both HF-2 and the new HF-3 AShM, by leaving room for the larger HF-3 missile boxes. Same was done to the OH Perry/Cheng Kung class frigate's new HF-2 launchers after each frigate's major overhaul, starting 2001, that allows the launcher to carry larger HF-3 AShM, besides HF-2. Ching Chiang class patrol ship(total 12 built) also are undergoing same upgrade to carry 2x2 HF-2/3 anti-ship missiles. Kuang Hua VI class missile boat (31 to be built) also carry 2x2 HF-2 anti-ship missile.

A submarine-launched version was planned and designed in the mid-1990s, but nothing more was heard. Selling of the UGM-84 by US in 2001 may probably terminate it. Not confirm of any submarine-launched version exist, nor US had sold any UGM-84 Harpoon to this date, or Taiwan has announced any purchase of sub Harpoon, or any submarine-launched HF-2.

## 5.10.2 Future development

Although the next generation supersonic SSM, the HF-3, has recently completed its development and will start production soon, the development of the HF-2 continues.

In mid-1990s the fuel for HF-2 was changed, which doubled its range (80 km to 160 km). The IR seeker was also being changed to an IR imaging seeker, which greatly enhance the IRCCM ability. Also, with the IR imaging seeker, the HF-2 was then able to attack shore targets also, with pre-stored target shape inside missile's computer, but an HF-2 land attack ability was never confirmed.

In the late 1990s CSIST begin to develop the supersonic version of HF-2, which could accelerate to low supersonic speed (Mach 1.5) in final dash, thus increase its chance to kill the target. Development was rumored finished, and some older HF-2 was being replaced with the new supersonic HF-2. But this supersonic HF-2 version is believed to be a myth.

Some HF-2 batteries are located on Taiwan's outlying islands, with others fitted on naval vessels. These missiles have had their radars and IR seekers replaced with GPS guidance units and TV/IR seekers for terminal guidance. This is designed to serve as a deterrent to mainland China, and will continue to do so until CSIST completed development of the HF-2E. As with the above, however, the existence of a land-attack version of the HF-2 anti-ship missile is unconfirmed, and media reports claiming the new missiles have a range of between 1000 and 2000

miles have been dismissed by the Ministry of National Defense as "sheer fabrication[s]."

In late 2014, CSIST reportedly began the test-launching stage of an extended-range version of the HF-2, increasing range from 160 km (99 mi) to 250 km (160 mi).<sup>\*[1]</sup>

## 5.10.3 General characteristics

- Primary Function: Anti-ship missile, some prototypes land attack cruise missiles
- Power Plant: Solid propellant booster, turbojet in-flight
- Range: 160 km (antiship)
- Top Speed: 0.85 Mach
- Weight: 685 kg
- Length: 4.8 m
- Diameter: 40 cm
- Warhead: 180 kg high-explosive warhead plus advanced technology self-forging fragmentation
- Guidance: Inertial guidance midflight, terminal with dual active radar homing and infrared homing seekers
- Date Deployed: Early 1990s

## 5.10.4 See also

- Hsiung Feng I
- Hsiung Feng IIE
- Hsiung Feng III

## 5.10.5 External links

- Taiwan primer
- GlobalSecurity article on the HF-2

## 5.10.6 References

[1] Taiwan Navy Accepts New Catamaran - Defense-news.com, 31 December 2014

# Chapter 6

## Foreign Navy Transfers

### 6.1 ORP General Tadeusz Kościuszko

**ORP General Tadeusz Kościuszko** (pendant 273), the former **USS Wadsworth (FFG-9)**, is one of two *Oliver Hazard Perry*-class guided-missile frigates in the Polish Navy. She is named for **Tadeusz Kościuszko**, an American Revolutionary War hero and hero of Poland's struggle for independence. *General Tadeusz Kościuszko* is homeported in **Gdynia Oksywie**, and has participated in numerous NATO exercises in the Baltic Sea.

#### 6.1.1 See also

- SS *Kościuszko*

#### 6.1.2 External links

- NavySite.de
- Polish Navy official site about Perry class (in English)

### 6.2 ORP General Kazimierz Pułaski

**ORP General Kazimierz Pułaski** is one of two *Oliver Hazard Perry*-class guided-missile frigates of the Polish Navy. Formerly serving in the United States Navy as **USS Clark**, after her transfer to Poland she was named for **Kazimierz Pułaski**, an American Revolutionary War hero in the United States and an independence hero in Poland.

*Clark* was decommissioned and stricken on 15 March 2000. That same day, she was transferred to Poland. She is propelled by two **General Electric LM-2500** gas turbines and two 350 horsepower (261 kW) electric drive auxiliary propulsion units.

She was renamed on 25 June 2000 in a ceremony attended by Madeleine Albright. Commander Marian Ambroziak

was the first Polish Commanding Officer. *General Kazimierz Pułaski* is homeported at **Gdynia (Oksywie)**, and has participated in numerous NATO exercises in the Baltic.

#### 6.2.1 See also

- USS *Pulaski* for US Navy ships of this name.

#### 6.2.2 External links

- NavySite.de
- Polish Navy official site about Perry class in English
- Polish Navy official web about ORP *Pulaski* in Polish

#### 6.2.3 References

### 6.3 RBNS Sabha (FFG-90)

**RBNS Sabha** (formerly known as **USS Jack Williams (FFG-24)**) during its career in US) is a frigate now in service with the Royal Bahrain Naval Force. The ownership was transferred to Bahrain as a gift on 13 September 1996. The frigate was ordered by the US Navy on 28 February 1977, and laid down on 25 February 1980. It was officially launched by the US Navy on 30 August 1980. The frigate is now considered as the lead frigate of the Royal Bahrain Naval Force.

#### 6.3.1 History

Main article: **USS Jack Williams (FFG-24)**

During its career as **USS Jack Williams (FFG-24)** in the United States, it was the sixteenth ship of the *Oliver Hazard Perry* class of guided-missile frigates. It was named for Pharmacist's Mate Second Class Jack Williams, who was posthumously awarded the Medal of Honor for his heroism in the Battle of Iwo Jima.

The frigate was ordered from Bath Iron Works on 28 February 1977 as part of the FY77 Program. *Jack Williams* was laid down on 25 February 1980; launched on 30 August 1980 and commissioned on 19 September 1981. Decommissioned and stricken on 13 September 1996, she was transferred to Bahrain the same day, and recommissioned as the RBNS *Sabha*. USS *Jack Williams* (FFG-24) was the first ship of that name in the US Navy.

### 6.3.2 See also

- Bahrain Defense Force

### 6.3.3 External links

- USS *Jack Williams*

# Chapter 7

## Construction Sites

### 7.1 Bath Iron Works

Warning: Page using Template:Infobox company with unknown parameter "origins" (this message is shown only in preview).

Bath Iron Works (BIW) is a major American shipyard



Bath Iron Works from *NAS Brunswick photo gallery*

located on the Kennebec River in Bath, Maine. Since its founding in 1884 (as Bath Iron Works, Limited), BIW has built private, commercial and military vessels, most of which have been ordered by the United States Navy. The shipyard has built and sometimes designed battleships, frigates, cruisers and destroyers, including the *Arleigh Burke* class, which are currently among the world's most advanced surface warships.

Since 1995, Bath Iron Works has been a subsidiary of **General Dynamics**, the fifth-largest defense contractor in the world (as of 2008). During World War II, ships built at BIW were considered by sailors and Navy officials to be of superior toughness, giving rise to the phrase "*Bath-built is best-built.*" \*<sup>[1]</sup>

#### 7.1.1 History

Bath Iron Works was incorporated in 1884 by General Thomas W. Hyde, a native of Bath who served in the American Civil War. After the war, Hyde bought a local shop that helped make windlasses and other iron hardware for the wooden ships built in Bath's many shipyards.

He expanded the business by improving its practices, entering new markets, and acquiring other local businesses.

By 1882, Hyde Windlass was eyeing the new and growing business of iron shipbuilding; two years later, it incorporated as Bath Iron Works. On February 28, 1890, BIW won its first contract for complete vessels, two iron gunboats for the U.S. Navy. The *Machias*, one of these 190-foot (58 m) gunboats, was the first ship launched by the company. (Historian Snow (see "Further Reading") says the gunboat was commanded during World War I by **Chester Nimitz**, an assertion that is not supported by Nimitz's biographers.)

In 1892, the yard won its first commercial contract for a steel vessel, the 2,500-ton steel passenger steamer *City of Lowell*. In the 1890s, the company built several yachts for wealthy sailors.

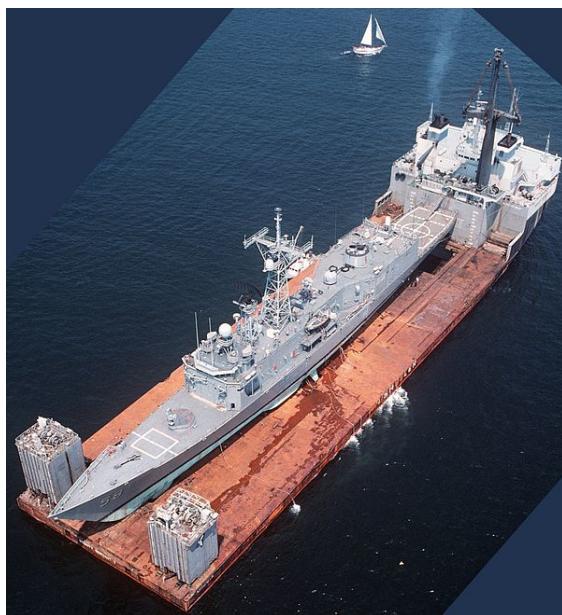
In 1899, General Hyde, suffering from the Bright's Disease that would kill him later that year, resigned from management of the shipyard, leaving his sons Edward and John in charge. That year the shipyard began construction of the *Georgia*, the only battleship to be built in Bath. The ship dominated the yard for five years until its launching in 1904, and was at times the only ship under construction. The yard faced numerous challenges because of the weight of armor and weapons. In sea trials, the *Georgia* averaged 19.26 knots (35.67 km/h) for four hours, making her the fastest ship in her class and the fastest battleship in the Navy.

The company continued to rely on Navy contracts, which provided 86% of the value of new contracts between 1905 and 1917. The yard also produced fishing trawlers, freighters, and yachts throughout the first half of the century.

At peak production during World War II (1943–1944), the shipyard launched a destroyer every 17 days. Bath Iron Works ranked 50th among United States corporations in the value of World War II military production contracts.\*<sup>[2]</sup>

In 1981, Falcon Transport ordered two tankers, the last commercial vessels built by BIW.

In 1988, the **USS Samuel B. Roberts** (FFG-58), commissioned two years earlier at Bath, survived a mine explo-



*MV Mighty Servant 2 carrying mine-damaged Roberts on 31 July 1988*

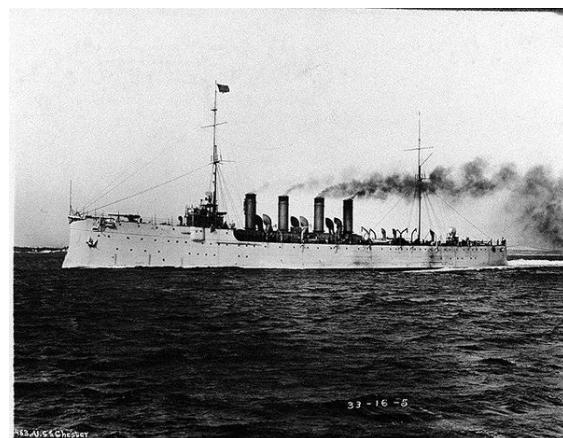
sion that tore a hole in its engine room and flooded two compartments. Over the next two years, BIW repaired the *Roberts* in unique fashion. The guided missile frigate was towed to the company's dry dock in Portland, Maine, and put up on blocks, where its damaged engine room was cut out of the ship. Meanwhile, workers in Bath built a 315-ton replacement. When it was ready, the module was floated south to Portland, placed on the dry dock, slid into place under the *Roberts*, jacked up, and welded into place.\* [3] By surviving a hit that Naval Sea Systems Command engineers thought should have sunk her, the *Roberts* validated the penny-pinching design of the *Oliver Hazard Perry* class, the U.S. Navy's largest post-WWII class until the *Burkes*; and validated the Navy's against-the-odds decision to have picked BIW to design it.

In 2001, BIW wrapped up a four-year effort to build an enormous concrete platform, the Land Level Transfer Facility, for final assembly of its ships. Instead of being built on a sloping way so that they could slide into the Kennebec at launch, hulls were henceforth moved by rail from the platform horizontally onto a moveable dry dock. This greatly reduced the work involved in building and launching the ships.\* [4] The 750-foot, 28,000-ton dry dock was built by China's Jiangdu Yuchai Shipbuilding Company for \$27 million.\* [5]

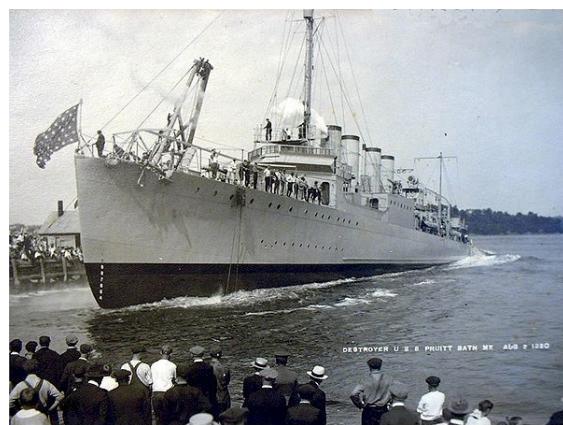
The Centennial Shipbuilders Workers Monument in Bath, Maine is by American artist Guillermo Esparza and is part of the Smithsonian American Art Museum collection.

### 7.1.2 Notable ships built

- Yachts



*USS Chester (CL-1) was the first United States cruiser of the numbering series used through the first half of the 20th century.*



*The last of the “four-stack” destroyers, USS Pruitt (DD-347) being launched from Bath Iron Works in 1920.*

- Ranger, successful America's Cup defender
- Aras II, Presidential Yacht known as USS Williamsburg
- Lightvessels
  - Diamond Shoal Lightship No. 71 (LV-71)
  - Nantucket Lightship 66
  - Nantucket Lightship 106
- Naval ram
  - USS Katahdin
- Monitor
  - USS Nevada (BM-8)\* [6]
- Denver class protected cruiser
  - USS Cleveland (C-19) World War I
- Virginia-class battleship
  - USS Georgia (BB-15), launched in 1904

- *Chester*-class cruiser
  - USS *Chester* (CL-1) World War I
- *Smith*-class destroyers
  - USS *Flusser* (DD-20) World War I
  - USS *Reid* (DD-21) World War I
- *Paulding*-class destroyers
  - USS *Paulding* (DD-22) World War I - Rum Patrol
  - USS *Drayton* (DD-23) World War I
  - USS *Trippe* (DD-33) World War I - Rum Patrol
  - USS *Jouett* (DD-41) World War I - Rum Patrol
  - USS *Jenkins* (DD-42) World War I
- *Cassin*-class destroyers
  - USS *Cassin* (DD-43) World War I - Rum Patrol
  - USS *Cummings* (DD-44) World War I - Rum Patrol
- *O'Brien*-class destroyer
  - USS *McDougal* (DD-54) World War I - Rum Patrol
- *Tucker*-class destroyer
  - USS *Wadsworth* (DD-60) World War I
- *Sampson*-class destroyers
  - USS *Davis* (DD-65) World War I - Rum Patrol
  - USS *Allen* (DD-66)\*[7] World War I - Attack on Pearl Harbor
- *Caldwell*-class destroyer
  - USS *Manley* (DD-74)\*[8] World War I - Guadalcanal Campaign - Operation Flintlock - Battle of Saipan - Philippines campaign (1944-45)
- *Wickes*-class destroyers
  - USS *Wickes* (DD-75)\*[9] World War I - Destroyers for Bases Agreement
  - USS *Philip* (DD-76)\*[9] World War I - Destroyers for Bases Agreement
  - USS *Woolsey* (DD-77)\*[9] World War I
  - USS *Evans* (DD-78)\*[9] Destroyers for Bases Agreement
  - USS *Buchanan* (DD-131)\*[9] Destroyers for Bases Agreement - St. Nazaire Raid



*Two of the seven Bath Iron Works destroyers transferred to the Royal Navy in the Destroyers for Bases Agreement. The outboard ship made the St. Nazaire Raid.*

- USS *Aaron Ward* (DD-132)\*[9] Destroyers for Bases Agreement
- USS *Hale* (DD-133)\*[9] Destroyers for Bases Agreement
- USS *Crowninshield* (DD-134)\*[9] Destroyers for Bases Agreement
- *Clemson*-class destroyers
  - USS *Preble* (DD-345)\*[10] Attack on Pearl Harbor - Guadalcanal Campaign
  - USS *Sicard* (DD-346)\*[10] Attack on Pearl Harbor - Battle of Empress Augusta Bay
  - USS *Pruitt* (DD-347)\*[10] Attack on Pearl Harbor



*USCGC *Icarus* (WPC-110) delivers prisoners from U-352 to Charleston Navy Yard on 10 May 1942.*

- *Thetis*-class patrol boat
  - USCGC *Aurora* (WPC-103)\*[11]
  - USCGC *Calypso* (WPC-104)\*[11]

- USCGC *Daphne* (WPC-106)\*[12]
- USCGC *Hermes* (WPC-109)\*[12]
- USCGC *Icarus* (WPC-110)\*[12] sank *U-352*
- USCGC *Perseus* (WPC-114)\*[12]
- USCGC *Thetis* (WPC-115)\*[12] sank *U-157*
- *Farragut*-class destroyers (1934)
  - USS *Dewey* (DD-349)\*[13] Attack on Pearl Harbor - Battle of the Coral Sea\*[14] - Battle of Midway - Guadalcanal Campaign - Battle of the Eastern Solomons - Battle of the Philippine Sea\*[15]
- The J-class yacht *Ranger*, 1936
- *Mahan*-class destroyers
  - USS *Drayton* (DD-366)\*[16] Battle of Tassafaronga\*[17] Philippines campaign (1944-45)
  - USS *Lamson* (DD-367)\*[16] Battle of Tassafaronga\*[17] - Philippines campaign (1944-45) - sunk in test Able of Operation Crossroads
- *Somers*-class destroyers
  - USS *Sampson* (DD-394)\*[16]
  - USS *Davis* (DD-395)\*[16]
  - USS *Jouett* (DD-396)\*[16] Invasion of Normandy
- *Sims*-class destroyers
  - USS *Sims* (DD-409)\*[18] Battle of the Coral Sea\*[19]
  - USS *Hughes* (DD-410)\*[18] Battle of Midway\*[20] - Battle of the Santa Cruz Islands\*[21] - Naval Battle of Guadalcanal\*[22] - Philippines campaign (1944-45)
- *Gleaves*-class destroyers
  - USS *Gleaves* (DD-423)\*[18] invasions of Sicily, Italy and Southern France
  - USS *Niblack* (DD-424)\*[18] invasions of Sicily, Italy and Southern France
  - USS *Livermore* (DD-429)\*[23] invasions of North Africa and Southern France
  - USS *Eberle* (DD-430)\*[23] invasions of North Africa and Southern France
  - USS *Woolsey* (DD-437)\*[23] invasions of North Africa, Sicily and Italy
  - USS *Ludlow* (DD-438)\*[23] invasions of North Africa, Sicily, Italy and Southern France
  - USS *Emmons* (DD-457)\*[24] invasions of North Africa, Normandy, Southern France and Okinawa



Nicholas holds the United States Navy record for battle stars with 16 from World War II, 5 from the Korean War and 9 from the Vietnam War

- USS *Macomb* (DD-458)\*[24] invasions of North Africa, Southern France and Okinawa
- *Fletcher*-class destroyers
  - USS *Nicholas* (DD-449)\*[25] Guadalcanal campaign - Philippines campaign (1944-45) - Korean War - Vietnam War
  - USS *O'Bannon* (DD-450)\*[25] Naval Battle of Guadalcanal\*[26] Guadalcanal campaign - Naval Battle of Vella Lavella\*[27] - Philippines campaign (1944-45) - Korean War - Vietnam War
  - USS *Chevalier* (DD-451)\*[25] Guadalcanal campaign - Naval Battle of Vella Lavella\*[27]
  - USS *Strong* (DD-467)\*[25] Guadalcanal campaign
  - USS *Taylor* (DD-468)\*[25] Guadalcanal campaign - Philippines campaign (1944-45) - Korean War - Vietnam War
  - USS *De Haven* (DD-469)\*[25] Guadalcanal campaign
  - USS *Conway* (DD-507)\*[28] Guadalcanal campaign - Philippines campaign (1944-45) - Korean War
  - USS *Cony* (DD-508)\*[28] Guadalcanal campaign - Philippines campaign (1944-45) - Battle of Surigao Strait - Korean War
  - USS *Converse* (DD-509)\*[28] Guadalcanal campaign - Battle of Empress Augusta Bay\*[29] Battle of Cape St. George\*[30] - Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45)
  - USS *Eaton* (DD-510)\*[28] Guadalcanal campaign - Philippines campaign (1944-45)
  - USS *Foote* (DD-511)\*[28] Guadalcanal campaign - Battle of Empress Augusta Bay\*[29] - Philippines campaign (1944-45) - Battle of Okinawa

- USS *Spence* (DD-512)\*[28] Guadalcanal campaign - Battle of Empress Augusta Bay\*[29] - Battle of Cape St. George\*[30] - Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45)
- USS *Terry* (DD-513)\*[28] Guadalcanal campaign - Battle of the Philippine Sea\*[15] - Battle of Iwo Jima
- USS *Thatcher* (DD-514)\*[28] Guadalcanal campaign - Battle of Empress Augusta Bay\*[29] - Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45) - Battle of Okinawa
- USS *Anthony* (DD-515)\*[28] Guadalcanal campaign - Battle of the Philippine Sea\*[15] - Battle of Okinawa
- USS *Wadsworth* (DD-516)\*[28] Guadalcanal campaign - Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45) - Battle of Okinawa
- USS *Walker* (DD-517)\*[28] Philippines campaign (1944-45) - Battle of Okinawa - Korean War - Vietnam War
- USS *Abbot* (DD-629)\*[31] Philippines campaign (1944-45)
- USS *Braine* (DD-630)\*[31] Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45) - Battle of Okinawa
- USS *Erben* (DD-631)\*[31] Philippines campaign (1944-45) - Battle of Okinawa - Korean War
- USS *Hale* (DD-642)\*[31] Philippines campaign (1944-45) - Battle of Okinawa
- USS *Sigourney* (DD-643)\*[31] Guadalcanal campaign - Philippines campaign (1944-45) - Battle of Surigao Strait
- USS *Stembel* (DD-644)\*[31] Philippines campaign (1944-45) - Battle of Okinawa - Korean War
- USS *Caperton* (DD-650)\*[31] Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45)
- USS *Cogswell* (DD-651)\*[31] Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45) - Vietnam War
- USS *Ingersoll* (DD-652)\*[31] Philippines campaign (1944-45)\*[15] - Vietnam War
- USS *Knapp* (DD-653)\*[31] Battle of the Philippine Sea\*[15] - Philippines campaign (1944-45)
- USS *Remy* (DD-688)\*[32] Battle of Saipan - Philippines campaign (1944-45) - Battle of Surigao Strait - Battle of Okinawa
- USS *Wadleigh* (DD-689)\*[32] Battle of Saipan
- USS *Norman Scott* (DD-690)\*[32] Battle of Saipan
- USS *Mertz* (DD-691)\*[32] Philippines campaign (1944-45)
- *Allen M. Sumner*-class destroyers
  - USS *Barton* (DD-722)\*[33] Invasion of Normandy - Philippines campaign (1944-45) - Korean War
  - USS *Walke* (DD-723)\*[33] Invasion of Normandy - Philippines campaign (1944-45) - Battle of Okinawa - Korean War - Vietnam War
  - USS *Laffey* (DD-724)\*[33] Invasion of Normandy - Philippines campaign (1944-45) - Battle of Okinawa - Korean War - preserved National Historic Landmark in Charleston, South Carolina
  - USS *O'Brien* (DD-725)\*[33] Invasion of Normandy - Philippines campaign (1944-45) - Korean War - Vietnam War
  - USS *Meredith* (DD-726)\*[33] Invasion of Normandy
  - USS *De Haven* (DD-727)\*[33] Philippines campaign (1944-45) - Battle of Okinawa - Korean War
  - USS *Mansfield* (DD-728)\*[33] Philippines campaign (1944-45) - Korean War - Vietnam War
  - USS *Lyman K. Swenson* (DD-729)\*[33] Philippines campaign (1944-45) - Battle of Okinawa - Korean War - Vietnam War
  - USS *Collett* (DD-730)\*[33] Philippines campaign (1944-45) - Korean War
  - USS *Maddox* (DD-731)\*[33] Battle of Okinawa - Korean War - Gulf of Tonkin Incident - Vietnam War
  - USS *Hyman* (DD-732)\*[33] Battle of Okinawa - Korean War
  - USS *Mannert L. Abele* (DD-733)\*[33] Battle of Okinawa
  - USS *Purdy* (DD-734)\*[33] Battle of Okinawa - Korean War
  - USS *Robert H. Smith* (DM-23)\*[10] Battle of Okinawa
  - USS *Thomas E. Fraser* (DM-24)\*[10] Battle of Okinawa
  - USS *Shannon* (DM-25)\*[10] Battle of Okinawa
  - USS *Harry F. Bauer* (DM-26)\*[10] Battle of Okinawa

- USS *Adams* (DM-27)\*[10] Battle of Okinawa
- USS *Tolman* (DM-28)\*[10] Battle of Okinawa
- USS *Drexler* (DD-741)\*[33] Battle of Okinawa



Agerholm launched an ASROC anti-submarine rocket armed with a nuclear depth bomb during the Swordfish test of 1962

- *Gearing*-class destroyers
  - USS *Frank Knox* (DD-742)\*[34] World War II - Korean War - Vietnam War
  - USS *Southerland* (DD-743)\*[34] World War II - Korean War - Vietnam War
  - USS *Chevalier* (DD-805)\*[35] Korean War
  - USS *Higbee* (DD-806)\*[35] World War II - Korean War - Vietnam War - Battle of Dong Hoi
  - USS *Benner* (DD-807)\*[35] World War II - Vietnam War
  - USS *Dennis J. Buckley* (DD-808)\*[35] Vietnam War
  - USS *Agerholm* (DD-826)\*[35] Korean War - Vietnam War
  - USS *Robert A. Owens* (DD-827)\*[35]
  - USS *Timmerman* (DD-828)\*[35] (Experimental ship completed with aluminum superstructure and high-horsepower engines)
  - USS *Myles C. Fox* (DD-829)\*[35] Vietnam War
  - USS *Everett F. Larson* (DD-830)\*[35] Vietnam War
  - USS *Goodrich* (DD-831)\*[35]
  - USS *Hanson* (DD-832)\*[35] Korean War - Vietnam War
  - USS *Herbert J. Thomas* (DD-833)\*[35] Korean War - Vietnam War
- *Dealey*-class destroyer escorts
  - USS *Dealey* (DE-1006)\*[37]
  - USS *Cromwell* (DE-1014)\*[37]
  - USS *Hammerberg* (DE-1015)\*[37]



The second Cold War destroyer built by Bath Iron Works was named for the grandfather of Republican 2008 presidential candidate John S. McCain III.

- *Mitscher*-class destroyers
  - USS *Mitscher* (DL-2)\*[38]
  - USS *John S. McCain* (DL-3)\*[38] Vietnam War
- *Forrest Sherman*-class destroyers
  - USS *Forrest Sherman* (DD-931)\*[39]
  - USS *John Paul Jones* (DD-932)\*[39]
  - USS *Barry* (DD-933)\*[39] Vietnam War
  - USS *Manley* (DD-940)\*[39] Vietnam War
  - USS *Dupont* (DD-941)\*[39]
  - USS *Bigelow* (DD-942)\*[39] Vietnam War
  - USS *Hull* (DD-945)\*[39] Vietnam War
  - USS *Edson* (DD-946)\*[39] Vietnam War
  - USS *Somers* (DD-947)\*[39] Vietnam War
- *Charles F. Adams*-class destroyers
  - USS *Charles F. Adams* (DDG-2)\*[40]
  - USS *John King* (DDG-3)\*[40]
  - USS *Sampson* (DDG-10)\*[40]
  - USS *Sellers* (DDG-11)\*[40]
- *Farragut*-class destroyers (1958)
  - USS *Dewey* (DDG-45)\*[41]
  - USS *Preble* (DDG-46)\*[41] Vietnam War
- *Leahy*-class cruisers
  - USS *Leahy* (CG-16)\*[42]
  - USS *Harry E. Yarnell* (CG-17)\*[42]
  - USS *Worden* (CG-18)\*[42] Vietnam War
- *Belknap*-class cruisers
  - USS *Belknap* (CG-26)\*[43]
  - USS *Josephus Daniels* (CG-27)\*[43]
  - USS *Wainwright* (CG-28)\*[43] Vietnam War
  - USS *William H. Standley* (CG-32)\*[43] Vietnam War
  - USS *Biddle* (CG-34)\*[43] Vietnam War
- *Garcia*-class frigate
  - USS *Glover* (FF-1098)\*[44]
- *Brooke*-class frigates
  - USS *Talbot* (FFG-4)\*[45]
  - USS *Richard L. Page* (FFG-5)\*[45]
  - USS *Julius A. Furer* (FFG-6)\*[45]
- *Oliver Hazard Perry*-class frigates
  - USS *Oliver Hazard Perry* (FFG-7)\*[46]
- USS *McInerney* (FFG-8)\*[46]
- USS *Clark* (FFG-11)\*[46]
- USS *Samuel Eliot Morison* (FFG-13)\*[46]
- USS *Estocin* (FFG-15)\*[46]
- USS *Clifton Sprague* (FFG-16)\*[46]
- USS *Flatley* (FFG-21)\*[46]
- USS *Jack Williams* (FFG-24)\*[46]
- USS *Gallery* (FFG-26)\*[46]
- USS *Stephen W. Groves* (FFG-29)\*[46]
- USS *John L. Hall* (FFG-32)\*[46]
- USS *Aubrey Fitch* (FFG-34)\*[46]
- USS *Underwood* (FFG-36)\*[46]
- USS *Doyle* (FFG-39)\*[46]
- USS *Klakring* (FFG-42)\*[46]
- USS *Dewert* (FFG-45)\*[46]
- USS *Nicholas* (FFG-47)\*[46]
- USS *Robert G. Bradley* (FFG-49)\*[46]
- USS *Taylor* (FFG-50)
- USS *Hawes* (FFG-53)
- USS *Ebrod* (FFG-55)
- USS *Simpson* (FFG-56), launched August 31, 1984. One of four U.S. Navy ships in commission to have sunk an enemy vessel with shipboard weaponry, the others being the USS *Constitution*, USS *Porter* (DDG-78), and USS *Carter Hall* (LSD-50),
- USS *Samuel B. Roberts* (FFG-58), launched in 1984 and repaired after being punctured by a mine in 1988
- USS *Kauffman* (FFG-59)
- *Ticonderoga*-class cruisers
  - USS *Thomas S. Gates* (CG-51)
  - USS *Philippine Sea* (CG-58)
  - USS *Normandy* (CG-60)
  - USS *Monterey* (CG-61)
  - USS *Cowpens* (CG-63)
  - USS *Gettysburg* (CG-64)
  - USS *Shiloh* (CG-67)
  - USS *Lake Erie* (CG-70), 21 Feb 2008 shot down the errant USA 193 satellite with a modified SM3 missile.
- *Arleigh Burke*-class destroyers
  - USS *Arleigh Burke* (DDG-51), commissioned July 4, 1991.
  - USS *John Paul Jones* (DDG-53)
  - USS *Curtis Wilbur* (DDG-54)

- USS *John S. McCain* (DDG-56)
  - USS *Laboon* (DDG-58)
  - USS *Paul Hamilton* (DDG-60)
  - USS *Fitzgerald* (DDG-62)
  - USS *Carney* (DDG-64)
  - USS *Gonzalez* (DDG-66)
  - USS *The Sullivans* (DDG-68)
  - USS *Hopper* (DDG-70)
  - USS *Mahan* (DDG-72)
  - USS *Decatur* (DDG-73)
  - USS *Donald Cook* (DDG-75)
  - USS *Higgins* (DDG-76)
  - USS *O'Kane* (DDG-77)
  - USS *Oscar Austin* (DDG-79)
  - USS *Winston S. Churchill* (DDG-81)
  - USS *Howard* (DDG-83)
  - USS *McCampbell* (DDG-85)
  - USS *Mason* (DDG-87)
  - USS *Chafee* (DDG-90)
  - USS *Momsen* (DDG-92)
  - USS *Nitze* (DDG-94)
  - USS *Bainbridge* (DDG-96), launched in 2005
  - USS *Farragut* (DDG-99)
  - USS *Gridley* (DDG-101), launched in 2006
  - USS *Sampson* (DDG-102)
  - USS *Sterett* (DDG-104)
  - USS *Stockdale* (DDG-106)
  - USS *Wayne E. Meyer* (DDG-108)
  - USS *Jason Dunham* (DDG-109)
  - USS *Michael Murphy* (DDG-112)
  - Zumwalt-class destroyers
    - USS *Zumwalt* (DDG-1000)
- [7] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.103
- [8] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.276
- [9] Fahey, James C. *The Ships and Aircraft of the United States Fleet* Ships and Aircraft (1939) p.17
- [10] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.212
- [11] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.380
- [12] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.383
- [13] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.114
- [14] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.55
- [15] Tillman, Barrett *Clash of the Carriers* (2005) ISBN 0-451-21956-2 pp.301-306
- [16] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.118
- [17] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.140
- [18] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.126
- [19] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.54
- [20] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.74
- [21] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.122
- [22] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.128
- [23] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.129
- [24] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.132
- [25] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.135
- [26] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.127
- [27] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.148

### 7.1.3 References

- [1] See Peniston, Sanders, Snow.
- [2] Peck, Merton J. & Scherer, Frederic M. *The Weapons Acquisition Process: An Economic Analysis* (1962) Harvard Business School p.619
- [3] No Higher Honor: FFG 58 Repair
- [4] GDBIW.com
- [5] “Bath Iron Works picks Chinese firm” . United Press International. 1998-09-14. Retrieved 2008-10-18.
- [6] “Nevada”. *Dictionary of American Naval Fighting Ships*. United States Navy. Retrieved 12 December 2013.

- [28] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.138
- [29] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.153
- [30] Oftsie, R.A., RADM USN *The Campaigns of the Pacific War* United States Government Printing Office (1946) p.159
- [31] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.141
- [32] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.143
- [33] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) pp.146-7
- [34] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.148
- [35] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.150
- [36] Silverstone, Paul H. *U.S. Warships of World War II* Doubleday & Company (1968) p.152
- [37] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.458
- [38] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.435
- [39] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.439
- [40] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.437
- [41] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.432
- [42] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.431
- [43] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.429
- [44] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.456
- [45] Blackman, Raymond V. B. *Jane's Fighting Ships* (1970/71) p.452
- [46] Clement, Janet Ann, LT USNR "The FFG-7 Program: A Shipbuilding Status Report" *United States Naval Institute Proceedings* (June 1981) p.109

#### 7.1.4 Further reading

- Eskew, Garnett Laidlaw (1958). *Cradle of Ships*. New York: Putnam. ASIN B0007E5VY4. (First general history of BIW.)

- Peniston, Bradley (2006). *No Higher Honor: Saving the USS Samuel B. Roberts in the Persian Gulf*. Annapolis: Naval Institute Press. ISBN 1-59114-661-5. (Describes the construction of a Perry-class guided missile frigate, the training of its precommissioning crew at BIW, and the complex repair job that returned it to duty.)
- Sanders, Michael S. (1999). *The Yard: Building a Destroyer at the Bath Iron Works*. New York: HarperCollins. ISBN 0-06-019246-1. (Describes the construction of **USS Donald Cook (DDG-75)** at BIW.)
- Snow, Ralph L. (1987). *Bath Iron Works: The First Hundred Years*. Bath, Maine: Maine Maritime Museum. ISBN 0-9619449-0-0. (The definitive work on BIW from 1884-1987.)
- Toppan, Andrew (2002). *Bath Iron Works (Images of America: Maine)*. South Carolina: Arcadia Publishing. ISBN 0-7385-1059-9. (Historic and contemporary photos of BIW.)

#### 7.1.5 External links

- Bath Iron Works website
- **USS Samuel B. Roberts (FFG-58)** under repair at BIW's Portland dry dock

Coordinates: 43°54'16"N 69°48'53"W / 43.904494°N 69.814746°W

## 7.2 Vigor Shipyards



*USS Halyburton (FFG-40)—center—and other ships under construction at Todd Shipyards in Seattle, 1983*

**Vigor Shipyards** (formerly **Todd Shipyards**) was founded in 1916 as the **William H. Todd Corporation** through the merger of Robins Dry Dock & Repair Company of Erie Basin, Brooklyn, New York, the Tietjen &

Long Dry Dock Company of Hoboken, New Jersey, and the Seattle Construction and Dry Dock Company. The Seattle shipyard could trace its history back to 1882, when Robert Moran opened a marine repair shop at Yesler's Wharf. This shop became the Moran Brothers Shipyard in 1906 and the Seattle Construction & Dry Dock Company at the end of 1911.

The shipyard has performed building and maintenance work for, among others, the U.S. and Royal Australian Navies, the United States Coast Guard, and the Washington State Ferries. Its headquarters and operations are on Harbor Island at the mouth of Seattle's Duwamish Waterway. Todd ranked 26th among United States corporations in the value of World War II production contracts.\*[1]\*[2]

The 105-foot-long (32 m) hull of Disneyland's *Mark Twain* riverboat was built at Todd Shipyards in San Pedro, California in 1955.

In February 2011, Vigor Industrial purchased Todd for US\$130 million.\*[3] This included the Seattle, Everett and Bremerton operations. Today, Vigor Shipyards is a government repair subsidiary of Vigor Industrial.\*[4]

Locations\*[5]



*Master of Ceremonies and Vice President of Todd Pacific Shipyards Corporation, Hans K. Schaefer, speaks during christening and launching ceremonies for the guided missile frigate USS Reid (FFG-30) at the Todd Pacific Shipyards Corp., Los Angeles Division, 1981.*

- Seattle, Washington ( $47^{\circ}35'10''\text{N}$   $122^{\circ}21'25''\text{W}$  /  $47.586^{\circ}\text{N}$   $122.357^{\circ}\text{W}$ )
- Bremerton, Washington ( $47^{\circ}33'42''\text{N}$   $122^{\circ}38'09''\text{W}$  /  $47.561788^{\circ}\text{N}$   $122.635875^{\circ}\text{W}$ )
- Everett, Washington ( $47^{\circ}59'22''\text{N}$   $122^{\circ}13'10''\text{W}$  /  $47.989347^{\circ}\text{N}$   $122.219381^{\circ}\text{W}$ )
- Portland, Oregon ( $45^{\circ}33'57''\text{N}$   $122^{\circ}43'27''\text{W}$  /  $45.565746^{\circ}\text{N}$   $122.724237^{\circ}\text{W}$ )

## 7.2.1 Past Locations

- Los Angeles Division, San Pedro, California. ( $33^{\circ}45'11''\text{N}$   $118^{\circ}16'48''\text{W}$  /  $33.753^{\circ}\text{N}$   $118.280^{\circ}\text{W}$ ) Formerly Los Angeles Shipbuilding & Dry Dock Corporation, closed in 1989 following completion of its *Oliver Hazard Perry*-class frigate contract and after failing to win an *Arleigh Burke*-class destroyer contract.\*[6] Property is now part of the Port of Los Angeles, and has been completely converted into Berth 100 / West Basin Container Terminal.\*[7]
- San Francisco Division, Alameda, California. ( $37^{\circ}47'\text{N}$   $122^{\circ}17'\text{W}$  /  $37.79^{\circ}\text{N}$   $122.29^{\circ}\text{W}$ ) Opened 1901, by United Engineering Company, later named Bethlehem-Alameda Shipyard, then Todd San Francisco Division, 1949.\*[8] Mostly used as a repair or conversion facility; now closed.\*[9]\*[10] Documented by the *Historic American Engineering Record* as United Engineering Company Shipyard, survey HAER CA-295.\*[11]

## 7.2.2 References

- [1] Peck, Merton J; Scherer, Frederic M (1962). *The Weapons Acquisition Process: An Economic Analysis*. Harvard Business School. p. 619.
- [2] Herman, Arthur. *Freedom's Forge: How American Business Produced Victory in World War II*, pp. 121, 124, 133, 137, 202, Random House, New York, NY, 2012. ISBN 978-1-4000-6964-4.
- [3] "Vigor completes \$130M purchase of Todd Shipyards". *Puget Sound Business Journal*. 15 February 2011.
- [4] "Companies". *Vigor Industrial*. Retrieved 2013-06-06.
- [5] "Vigor Shipyards". *Vigor Industrial*. Retrieved 2013-06-06.
- [6] "Todd Los Angeles Division". *GlobalSecurity.org*. Retrieved 2012-07-15.
- [7] "Container Facilities". *Port of Los Angeles*.—Shows an aerial view of Berth 100, the former location of Todd - San Pedro.
- [8] "San Francisco Construction Projects". Powered by The People. 2009-06-13.
- [9] Herman, Arthur. *Freedom's Forge: How American Business Produced Victory in World War II*, p. 124, 178, Random House, New York, NY, 2012. ISBN 978-1-4000-6964-4.
- [10] "Todd San Francisco Division". *GlobalSecurity.org*. Retrieved 2012-07-15.
- [11] "United Engineering Company Shipyard, 2900 Main Street, Alameda, Alameda County, CA HAER CA-295". *Library of Congress*. Retrieved 2012-07-15.

### 7.2.3 External links

- “Todd Shipyards Seattle, Washington” . *Federation of American Scientists*.

# Chapter 8

## Power Plant and Propulsion

### 8.1 General Electric LM2500

The **General Electric LM2500** is an industrial and marine gas turbine produced by GE Aviation. The LM2500 is a derivative of the **General Electric CF6** aircraft engine.

The LM2500 is available in 3 different versions:

- The LM2500 delivers 33,600 shaft horsepower (shp) (25,060 kW) with a thermal efficiency of 37 percent at ISO conditions. When coupled with an electric generator, it delivers 24 MW of electricity at 60 Hz with a thermal efficiency of 36 percent at ISO conditions.\*[1]
- The improved, 3rd generation, LM2500+ version of the turbine delivers 40,500 shp (30,200 kW) with a thermal efficiency of 39 percent at ISO conditions. When coupled with an electric generator, it delivers 29 MW of electricity at 60 Hz with a thermal efficiency of 38 percent at ISO conditions.\*[2]\*[3]
- The latest, 4th generation, LM2500+G4 version was introduced in November 2005 and delivers 47,370 shp (35,320 kW) with a thermal efficiency of 39.3 percent at ISO conditions.\*[4]

The turbines have been used in various applications such as in **warships** of the U.S. and a number of other world navies, **hydrofoils**, **hovercraft** and fast **ferries**. As of 2004, more than one thousand LM2500/LM2500+ gas turbines have been in service for more than 29 international navies.\*[5]

Recently, the increasing demands for low weight, high power engines in the oil and gas industry has led to GE developing a dedicated version for offshore use. This **FPSO** version is lighter and more compact, and is being used both for electricity generation and for directly driving compressors, e.g. for compressing natural gas going out into pipelines.\*[6]

#### 8.1.1 Design and development

The LM2500 was first used in US Navy warships in the **Spruance** class of destroyers and the related **Kidd** class,



A heavy lift lowers the main propulsion module into the hull of **USS Bunker Hill (CG-52)** during construction at Ingalls Shipbuilding. The module consists of two General Electric LM2500 gas turbine engines and a Westinghouse gear reduction unit.

which were constructed from 1970. In this configuration it was rated to 21,500 shp (16,000 kW). This configuration was subsequently used into the 1980s in the **Oliver Hazard Perry** class frigates, and **Ticonderoga** class cruisers. It was also used by one of People's Republic of China's Type 052 Luhu Class Missile Destroyer (Harbin 112) acquired before the embargo.

The LM2500 was uprated to 26,500 shp (19,800 kW) for the **Arleigh Burke** class destroyers, which were initiated in the 1980s and started to see service in the early 1990s, and the T-AOE-6 class of fast combat tanker.

In 2001 the LM2500 ( 20 MW ) was installed in a sound-proof capsule in the South African Navy **Valour** class (Meko A-200 SAN) frigates as part of a CODAG propulsion system with two MTU 16V 1163 TB93 Propulsion Diesels.

The current generation was uprated in the late 1990s to over 30,000 shp (22,000 kW).

LM2500 installations place the engine inside a metal container for sound and heat isolation from the rest of the machinery spaces. This container is very near the size of a standard 40-foot (12 m) intermodal shipping container - but not the same, the engine size very slightly exceeds those dimensions. The air intake ducting may be designed and shaped appropriately for easy removal of the LM2500 from their ships.

The LM2500+ is an evolution of the LM2500, delivering up to 40,200 shp (30,000 kW) or 28.6 MW of electric energy when combined with an electrical generator. Two of such turbo-generators have been installed in the superstructure near the funnel of *Queen Mary 2*, the world's largest transatlantic ocean liner, for additional electric energy when the ship's four diesel-generators are working at maximum capacity or fail. Celebrity Cruises uses two LM2500+ engines in their *Millennium*-class ships in a COGAS cycle.

The LM2500 is license-built in Japan by Ishikawajima-Harima, in India by HAL, and in Italy by Avio.

The LM2500/LM2500+ can often be found as turbine part of CODAG or CODOG propulsion systems or in pairs as powerplants for COGAG systems.

## 8.1.2 Applications

*Aircraft carrier:*

- Italian aircraft carrier Cavour (C 550) (Italian Navy)
- HTMS Chakri Naruebet (Royal Thai Navy)
- Spanish aircraft carrier Príncipe de Asturias (Spanish Navy)
- Vikrant-class aircraft carrier (Indian Navy)

*Amphibious assault ship:*

- USS Makin Island (LHD-8) (United States Navy)
- Juan Carlos I (L61) (Spanish Navy)
- Canberra class landing helicopter dock (Royal Australian Navy)

*Cruiser:*

- Ticonderoga-class cruiser (United States Navy)

*Destroyer:*

- Arleigh Burke-class destroyer (United States Navy)

- Atago-class destroyer (Japan Maritime Self-Defense Force)
- Durand de la Penne-class destroyer (Italian Navy)
- Gwanggaeto the Great-class destroyer (Republic of Korea Navy)
- Kidd-class destroyer (United States Navy)
- Sejong the Great-class destroyer (Republic of Korea Navy)
- Kongō-class destroyer (Japan Maritime Self-Defense Force)
- Spruance-class destroyer (United States Navy)
- Type 052 destroyer (People's Liberation Army Navy)

*Frigate:*

- Adelaide-class frigate (Royal Australian Navy)
- Álvaro de Bazán-class frigate (Spanish Navy)
- Anzac-class frigate (Royal Australian Navy, Royal New Zealand Navy)
- Barbaros-class frigate (Turkish Navy)
- Brandenburg-class frigate (German Navy)
- Bremen-class frigate (German Navy)
- Cheng Kung-class frigate (Republic of China Navy)
- FREMM multipurpose frigate (French Navy, Italian Navy, Royal Moroccan Navy)
- Fridtjof Nansen class frigate (Royal Norwegian Navy)
- Halifax class frigate (Royal Canadian Navy)
- Horizon class frigate (French Navy, Italian Navy)
- Hydra class frigate (Hellenic Navy)
- Naresuan class (Royal Thai Navy)
- Oliver Hazard Perry class frigate (United States Navy)
- Sachsen class frigate (German Navy)
- Santa María class frigate (Spanish Navy)
- Shivalik class frigate (Indian Navy)
- Valour class frigate (South African Navy)
- Vasco da Gama class frigate (Portuguese Navy)
- Ulsan class frigate (Republic of Korea Navy)

*Fast Combat Support Ship:*

- Supply class fast combat support ship (United States Navy)

*Maritime Prepositioning Force:*

- Watson-class vehicle cargo ship (United States Navy)

*Littoral combat ship:*

- Independence class littoral combat ship (United States Navy)

*Corvette:*

- Ada-class corvette (Turkish Navy)
- Niels Juel class corvette (Royal Danish Navy)
- Sa'ar 5 class corvette (Israeli Navy)
- Inhauma class corvette (Brazilian Navy)

*Fast Attack Patrol boat*

- Pegasus class hydrofoil (United States Navy)

### 8.1.3 See also

**Related development**

- General Electric CF6
- General Electric LM1600
- General Electric LM6000
- General Electric LMS100

**Comparable engines**

- Rolls-Royce MT30

**Related lists**

- List of aircraft engines

### 8.1.4 References

- [1] “LM2500 Marine Gas Turbine Data Sheet” (PDF). GE Aviation.
- [2] “LM2500+ Marine Gas Turbine Data Sheet” (PDF). GE Aviation.

[3] Ramsdal, Roald. "På disse plattformene fyrer de minst for måkene" *Teknisk Ukeblad*, 27 October 2014.

[4] “LM2500+G4 Marine Gas Turbine Data Sheet” (PDF). GE Aviation.

[5] “GE Marine to Supply IHI with LM2500 Gas Turbines to Power Japan's 15DDG AEGIS Destroyer” (Press release). GE Aviation. 6 May 2004.

[6] “From aircraft to blowout preventer, GE's global technology cross-pollinates” . World Oil Online. 10 September 2012.

### 8.1.5 External links

- Official GE Aviation page for LM2500 (GEAE).
- Official GE Aviation page for LM2500+.
- Official GE Aviation page for LM2500+G4.
- FAS information page on US Navy LM2500 usage
- SA Navy Valour class frigate page

## 8.2 Azimuth thruster



*Siemens Schottel azimuth thrusters*

An **azimuth thruster** is a configuration of marine propellers placed in pods that can be rotated to any horizontal angle (azimuth), making a rudder unnecessary. These give ships better maneuverability than a fixed propeller and rudder system.

### 8.2.1 Types of azimuth thrusters

There are two major variants, based on the location of the motor:



*Azimuth thrusters on the tug Oued el Kebir - note the Kort nozzles*

1. Mechanical transmission, which connects a motor inside the ship to the outboard unit by gearing. The motor may be diesel or diesel-electric. Depending on the shaft arrangement, mechanical azimuth thrusters are divided into **L-drive** and **Z-drive**. An L-drive thruster has a vertical input shaft and a horizontal output shaft with one right-angle gear. A Z-drive thruster has a horizontal input shaft, a vertical shaft in the rotating column and a horizontal output shaft, with two right-angle gears.
2. Electrical transmission, more commonly called pods, where an electric motor is fitted in the pod itself, connected directly to the propeller without gears. The electricity is produced by an onboard engine, usually diesel or gas turbine. Invented in 1955 by Friedrich W. Pleuger and Friedrich Busmann (Pleuger Unterwasserpumpen GmbH), **ABB Group's Azipod** was the first product using this technology.

The most powerful podded thrusters in use are the four 21.5 MW Rolls-Royce Mermaid units fitted to *Queen Mary 2*.

Mechanical azimuth thrusters can be fixed installed, retractable or underwater-mountable. They may have fixed pitch propellers or controllable pitch propellers. Fixed installed thrusters are used for tugs, ferries and supply-

boats. Retractable thrusters are used as auxiliary propulsion for dynamically positioned vessels and take-home propulsion for military vessels. Underwater-mountable thrusters are used as dynamic positioning propulsion for very large vessels such as semi-submersible drilling rigs and drillships.

### 8.2.2 Advantages



*The BPC Dixmude manoeuvering in Jounieh bay; the wake at the aft is perpendicular to the ship, indicating the use of her azimuth thrusters.*

Primary advantages are electrical efficiency, better use of ship space, and lower maintenance costs. Ships with azimuth thrusters do not need **tugboats** to dock, though they still require tugs to maneuver in difficult places.

### 8.2.3 History

The azimuth thruster using the Z-drive transmission was invented in 1950 by Joseph Becker, the founder of Schottel in Germany, and marketed as the Ruderpropeller. Becker was awarded the 2004 Elmer A. Sperry Award for the invention.\*[1] This kind of propulsion was first patented in 1955 by Pleuger.\*[2]

In the late 1980s, **ABB Group** developed the **Azipod** thruster with the motor located in the pod itself.

### 8.2.4 See also

- Pleuger rudder
- Voith-Schneider
- Saildrive
- Z-drive

### 8.2.5 References

[1] “Presentation of The Elmer A. Sperry Award for 2004” (PDF). Sperryaward.org. Retrieved 24 November 2014.

[2] “Patent US2714866 - Device for propelling a ship” . Google.com. Retrieved 24 November 2014.

### 8.2.6 External links

- *Voith Turbo Marine*, Voith Radial Propeller
- Rolls-Royce plc, including videos of operation
- Azimuth Thrusters Types and Configurations, Thrustmaster
- Flowserve Thruster - promotional video showing L-drive type azimuth thruster operation



A Hamilton Standard variable-pitch propeller on a 1943 model Stinson V77 Reliant

## 8.3 Variable-pitch propeller

A **controllable-pitch propeller** (CPP) or **variable-pitch propeller** is a type of **propeller** with blades that can be rotated around their long axis to change the **blade pitch**. **Reversible propellers**—those where the pitch can be set to negative values—can also create reverse thrust for braking or going backwards without the need to change the direction of shaft revolution.

### 8.3.1 Aircraft



One of a C-130J Super Hercules' 6 bladed Dowty Rotol R391 composite controllable- and reversible-pitch propellers.

Propellers whose blade pitch could be adjusted while the aircraft was on the ground were used by a number of early aviation pioneers,<sup>\*[1]</sup> including A. V. Roe and Louis Breguet. In 1919 L. E. Baynes AFRAeS patented the first automatic variable-pitch airscrew.

The French aircraft firm Levasseur displayed a variable-pitch propeller at the 1921 Paris Airshow, which, it

claimed, had been tested by the French government in a ten-hour run and could change pitch at any engine RPM.<sup>\*[2]</sup>

Dr Henry Selby Hele-Shaw and T. E. Beacham patented a hydraulically operated variable-pitch propeller (based on a variable stroke pump) in 1924 and presented a paper on the subject before the Royal Aeronautical Society in 1928, though it was received with scepticism as to its utility.<sup>\*[3]</sup> The propeller had been developed with Gloster Aircraft Company—as the Gloster Hele-Shaw Beacham Variable Pitch Propellor—and was demonstrated on a Gloster Grebe, where it was used to maintain a near-constant RPM.<sup>\*[4]</sup>

The first practical controllable-pitch propeller for aircraft was introduced in 1932.<sup>\*[5]</sup> French firm Ratier pioneered variable-pitch propellers of various designs from 1928 onwards, relying on a special ball bearing helicoïdal ramp at the root of the blades for easy operation.

Several designs were tried, including a small bladder of pressurized air in the propeller hub providing the necessary force to resist a spring that would drive the blades from fine pitch (take-off) to coarse pitch (level cruising). At a suitable airspeed a disk on the front of the spinner would press sufficiently on the bladder's air-release valve to relieve the pressure and allow the spring to drive the propeller to coarse pitch. These “pneumatic” propellers were fitted on the DH88 Comet aircraft, winner of the famed long distance 1934 Mac Robertson race and in the Caudron C.460 winner of the 1936 National Air Races, flown by Michel Detryat. Use of these pneumatic propellers required presetting the propeller to fine pitch prior to take-off. This was done by pressurizing the bladder with a bicycle pump, hence the whimsical nickname *Gonfleurs d'hélices* (prop inflator boy) given to the aircraft ground mechanics in France up to this day.<sup>\*[6]</sup>

Such propellers are used in propeller-driven aircraft to adapt the propeller to different thrust levels and air speeds so that the propeller blades don't stall, hence degrading the propulsion system's efficiency. Especially for cruis-

ing, the engine can operate in its most economical range of rotational speeds. With the exception of going into reverse for braking after touch-down, the pitch is usually controlled automatically without the pilot's intervention. A propeller with a controller that adjusts the blade pitch so that the rotational speed always stays the same is called a ***constant-speed propeller***. A propeller with controllable pitch can have a nearly constant efficiency over a range of airspeeds.\*[7]

A common type of controllable-pitch propeller is hydraulically actuated; it was originally developed by Frank W. Caldwell of the **Hamilton Standard** Division of the United Aircraft Company. This design led to the award of the Collier Trophy of 1933.\*[8] de Havilland subsequently bought up the rights to produce Hamilton propellers in the UK, while the British company **Rotol** was formed to produce its own designs. The French company of **Pierre Levasseur** and Smith Engineering Co. in the United States also developed controllable-pitch propellers. Smith propellers were used by **Wiley Post** on some of his flights.

Another common type was originally developed by Wallace R. Turnbull and refined by the **Curtiss-Wright Corporation**.\*[9] This electrically-operated mechanism was first tested in on June 6, 1927 at Camp Borden, Ontario, Canada and patented in 1929 (U.S. Patent 1,828,348). It was favoured by some pilots in World War II, because even when the engine was no longer running the propeller could be feathered. On hydraulically-operated propellers the feathering had to happen before the loss of hydraulic pressure in the engine.

As experimental aircraft and microlights have become more sophisticated, it has become more common for such light aeroplanes to fit variable-pitch propellers, both **ground-adjustable propellers** and **in-flight-variable propellers**. Hydraulic operation is too expensive and bulky, and instead light aircraft use propellers that are activated mechanically or electrically. The **Silence Twister** prototype kitplane was fitted with the **V-Prop**, an automatic self-energising and electronically self-adjusting VP propeller.\*[10]

### 8.3.2 Ships

A variable-pitch propeller (VPP) can be efficient for the full range of rotational speeds and load conditions, since its pitch will be varied to absorb the maximum power that the engine is capable of producing. When fully loaded, a vessel obviously needs more propulsion power than when empty. By varying the propeller blades to the optimal pitch, higher efficiency can be obtained, thus saving fuel. A vessel with a VPP can accelerate faster from a standstill, and can decelerate much more effectively, making stopping quicker and safer. A VPP can also improve vessel maneuverability by directing a stronger flow of water onto the rudder.\*[11]



*A ship's variable-pitch propeller*

However, a fixed-pitch propeller (FPP) is both cheaper and more robust than a VPP. Also, an FPP is typically more efficient than a VPP for a single specific rotational speed and load condition. Accordingly, vessels that normally operate at a standard speed (such as large bulk carriers, **tankers** and **container ships**) will have an FPP optimized for that speed. At the other extreme, a canal **narrowboat** will have a FPP for two reasons: speed is limited to 4 mph (to protect the canal bank), and the propeller needs to be robust (when encountering underwater obstacles).

Vessels with medium or high speed diesel or gasoline engines use a reduction gear to reduce the engine output speed to an optimal propeller speed -- although the large low speed diesels, whose cruising RPM is in the 80 to 120 range, are usually direct drive with direct-reversing engines. While an FPP-equipped vessel needs either a reversing gear or a reversible engine to reverse, a VPP vessel may not. On a large ship the VPP requires a hydraulic system to control the position of the blades. Compared to an FPP, a VPP is more efficient in reverse as the blades' leading edges remain as such in reverse also, so that the hydrodynamic cross-sectional shape is optimal for both forward and reverse.

In the mid-1970s, Uljanik shipyard in Yugoslavia produced four **VLCCs** with VPPs – a tanker and three ore/oil carriers – each powered by two 20,000 bhp B & W diesel engines directly driving Kamewa variable-pitch

propellers. Due to the high construction cost none of these vessels ever returned a profit over their lifetimes. For these vessels, fixed-pitch propellers would have been more appropriate.\*[12]

Variable-pitch propellers are usually found on harbour or ocean-going tugs, dredgers, cruise ships, ferries, cargo vessels and larger fishing vessels. Prior to the development of VPPs, some vessels would alternate between “speed wheel” and “power wheel” propellers depending on the task. Current VPP designs can tolerate a maximum output of 44000 kW (60,000 hp).

Just like an aeronautical propeller, a marine VPP may be “feathered”. This is useful for motorsailers as this mode gives the least water resistance when sailing without using power. Also, when motorsailing, (i.e. voyaging under both power and sail) the VPP can be coarsened to incorporate the wind component.

Bruntons, a UK engineering firm in Essex, manufactures their patented “AutoProp”, a marine propeller where the blades swivel freely and automatically set to the optimum angle. The Autoprop is suitable for small to medium yachts and working boats. Unlike a fixed blade propeller, the Autoprop operates exactly as efficiently forward as in reverse, which is important for stopping and manoeuvering. The AutoProp is particularly beneficial for motorsailers, since if the sails are set, but the wind strength is insufficient to make good progress, the engine can be run and the Autoprop will then automatically coarsen to acknowledge the vessel's wind-driven speed component. When solely under sail, a motorsailer's AutoProp will automatically feather to give the minimum drag resistance.\*[13]

### 8.3.3 References

- [9] “The Turnbull Variable Pitch Propeller”. Flight. May 13, 1932. pp. 419–420. Retrieved 2013-03-05.
- [10] “Silence Twister”. Retrieved 2015-11-30.
- [11] <http://www.kastenmarine.com/CPprops.htm>
- [12] <http://vanhowar.jugem.jp/?eid=40>
- [13] <http://www.bruntons-propellers.com>

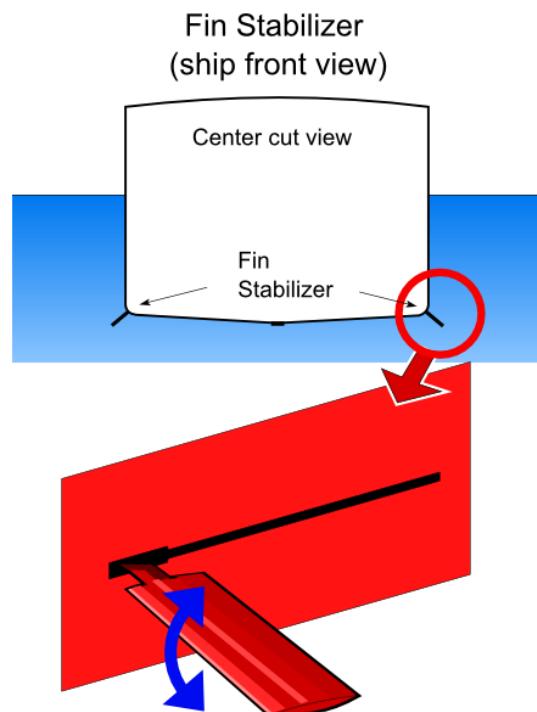
### 8.3.4 External links

- 1941 Cutaway Drawing of Hydromatic Variable Pitch Propeller Operation on B-24 bomber
- Contemporary discussion of merits of variable-pitch propellers in *Flight* magazine 1935
- CONTROLLABLE-PITCH AIRSCREWS explained in *Flight* 2 May 1935 and 9 May 1935

## 8.4 Stabilizer (ship)

This article is about the nautical term. For other uses, see **Stabilizer**.

**Ship stabilizers** are fins or rotors mounted beneath the



Location and diagram of retractable fin stabilizers on a ship.

waterline and emerging laterally from the hull to reduce a ship's roll due to wind or waves. **Active fins** are controlled by a gyroscopic control system. When the gyroscope senses the ship roll, it changes the fins' angle of attack to exert force to counteract the roll. **Fixed fins**



*Ship stabilizers: a fixed fin stabilizer (foreground centre) and bilge keels (left background).*

and **bilge keels** do not move; they reduce roll by hydrodynamic drag exerted when the ship rolls. Stabilizers are mostly used on ocean-going (blue water) ships.

#### 8.4.1 Function

Fins work by producing lift or **downforce** when the vessel is in motion. The lift produced by the fins should work against the roll moment of the vessel. To accomplish this two wings, one installed underwater on either side of the ship are used. Stabilizers can be:

- Retractable - All medium and large cruise and ferry ships have the ability to retract the fins into a space inside the hull in order to avoid extra fuel consumption when the use of the fins is not needed.
- Non-retractable - This is the case on very small ships, for example a yacht.

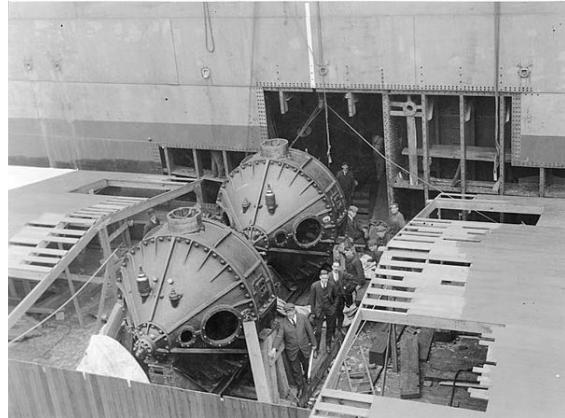
Stabilizer movement is similar to that of aircraft ailerons. Some types of fins, especially the ones installed on larger ships, are provided with flaps, that increase the fin lift by about 15%. Stabilizer control needs to consider numerous variables that change quickly: wind, waves, ship motion, draft, etc. Fin stabilizers are vastly more efficient at higher velocities and lose effectiveness when the ship is under a minimum speed.\* [1] Stabilization solutions at anchor or at low speed include actively-controlled fins (such as the *stabilisation at rest* system developed by Rolls Royce\* [2] that oscillate to counteract wave motion), and rotary cylinders employing the **Magnus effect**. The latter two systems are retractable, allowing for a thinner vessel profile when docking, and reducing drag while cruising.

#### 8.4.2 Fuel consumption and carbon emission

Fin stabilizers are used to reduce the roll motion of the ship and improve the passengers' comfort; however, they

can be a considerable hydro dynamic brake for the ship. Stabilizers can reduce a ship's speed due to an increase in hydrodynamic drag. This increases fuel consumption and CO<sub>2</sub> emissions. Some ships employ systems to reduce the stabilizers energy dissipation by using computers to control their motion. This reduces their fuel consumption and CO<sub>2</sub> emissions.

#### 8.4.3 History



*Two 25 ton gyroscopes installed on the USS Henderson transport during construction in 1917, the first large ship to be gyroscopically stabilized.*

The **bilge keel** is an early 20th-century stabilizing innovation, not as effective at reducing roll, but easier to install, and does not require space inside the **hull**.

An earlier stabilization technology was gyroscopic stabilization. The World War 1 transport **USS Henderson**, completed in 1917, was the first large ship with gyro stabilizers (*right*). It had two 25 ton, 9 ft diameter **flywheels** mounted near the center of the ship, spun at 1100 RPM by 75 HP AC motors. The gyroscopes' cases were mounted on vertical bearings. When a small sensor gyroscope on the bridge sensed a roll, a servomotor would rotate the gyros about a vertical axis in a direction so their precession would counteract the roll. In tests this system was able to reduce roll to 3 degrees in the roughest seas. The ship **Conte di Savoia**, which first sailed in November 1932, had three flywheels which were 13 feet in diameter and weighed 108 tons. Gyroscope stabilization was replaced by fin stabilization due to its lower weight and bulk.

The first mention of automatic stabilizers for ships was in 1932 by an engineer working for **General Electric**.\* [3]

The first use of fin stabilizers on a ship was by a Japanese cruise liner in 1933.\* [4]

In 1934 a Dutch liner introduced one of the world's most unusual ship stabilizer systems, in which two large tubes were mounted on each side of the ship's hull with the bottom of the tubes open to the sea. The top of the tubes had

compressed air or steam pumped in. As the ship rolled, the side it was rolling to would fill with water and then compressed air or steam would be injected to push the water down, countering the roll.\*[5]

In 2011 the first fuel saving stabilizer control to have been proven to improve ship speed, and to reduce fuel consumption and CO<sub>2</sub> emissions when using stabilizers was installed on board a passenger ship.

#### 8.4.4 See also

- Stabilization while not under way

#### 8.4.5 References

- [1] “Quantum Rotary Stabilizers” (video). YouTube. 2 June 2009.
- [2] “Stabilisation at rest” . *Products*. Rolls-Royce Group PLC.
- [3] “Fins Proposed For Big Liners To Prevent Rolling” . *Popular Mechanics*. August 1932. p. 251.
- [4] “Fins to Stop Ship's Rolling Governed by Gyro” . *Popular Mechanics*. April 1933. p. 509.
- [5] “Compressed Air Stabilizer Stops Roll of Ship” . *Popular Mechanics*. October 1934. p. 573.

\*[1]

[1] <http://www.pinfabb.com>

# Chapter 9

## Aircraft

### 9.1 Kaman SH-2 Seasprite

“SH-2” and “Seasprite” redirect here. For SH2 related uses, see [SH2 \(disambiguation\)](#). For Sea Sprite related uses, see [Sea Sprite \(disambiguation\)](#).

The **Kaman SH-2 Seasprite** is a ship-based helicopter originally developed in the late 1950s as a fast utility helicopter for the United States Navy. In the 1970s, anti-submarine, anti-surface threat capabilities were added to the design, including over-the-horizon targeting, resulting in modifying most existing UH-2 models to the *SH-2 Seasprite*.

This aircraft extends and increases shipboard sensor and weapon capabilities against several types of enemy threats, including submarines of all types, surface ships and patrol craft that may be armed with anti-ship missiles. It served with the U.S. Navy from the 1960s until the last SH-2G helicopters were retired in 2001.

#### 9.1.1 Design and development

##### Origins



A YUH-2A during ditching trials, 1963

In 1956, the U.S. Navy launched a competition to meet its requirement for a compact, all-weather multipurpose naval helicopter.<sup>\*[1]\*[2]</sup> Kaman's K-20 model was selected as the winner.<sup>\*[3]\*[4]</sup> Kaman was awarded a contract for four prototype and 12 production *HU2K-1* helicopters in late 1957.<sup>\*[1]</sup> Kaman's design was for a conventional helicopter powered by a single [General Electric T58-8F](#) turboshaft engine, driving a 44-foot four-bladed main rotor and a four-bladed tail rotor.<sup>\*[2]\*[3]</sup>

In 1960, the Royal Canadian Navy announced that the *HU2K* was the frontrunner for a large anti-submarine warfare contract; the [Canadian Treasury Board](#) had approved an initial procurement of 12 units for \$14.5 million.<sup>\*[5]</sup> Abruptly, Kaman raised the estimated price to \$23 million, and there was concern that the manufacturer's weight and performance projections were overly optimistic. The Naval Board decided to wait until after the US Navy had conducted sea trials before approving the purchase.<sup>\*[6]</sup> These trials revealed the *HU2K* to be overweight and underpowered, and thus incapable of meeting Canadian requirements. Hence, in late 1961, the [Sikorsky Sea King](#) was selected.<sup>\*[7]</sup>

With no follow-on orders, Kaman ended production in the late 1960s after delivering 184 SH-2s to the U.S. Navy; production was later restarted in 1971 to manufacture an improved variant of the helicopter, the *SH-2F*.<sup>\*[8]</sup> A significant factor in the reopening of the production line was that the Navy's [Sikorsky SH-60 Sea Hawk](#), which was newer and more capable in anti-submarine operations, was too large to be operated from the small flight decks of older frigates.<sup>\*[9]</sup>

##### Further development

Upon enactment of the 1962 United States Tri-Service aircraft designation system, the *HU2K-1* was redesignated *UH-2A* and the *HU2K-1U* was redesignated *UH-2B*. In service, the *UH-2 Seasprite* would see several modifications and improvements, such as the addition of fixtures for mounting external stores. Beginning in 1968, the Navy's remaining *UH-2s* were extensively remanufactured, their single engines being replaced by a twin-engine arrangement.<sup>\*[10]</sup>



A UH-2C aboard the USS Hancock between July 1968 and March 1969



UH-2 in flight over the Tonkin Gulf, 1970

The UH-2 was selected to be the airframe for the interim Light Airborne Multi-Purpose System (LAMPS) helicopter in October 1970.\*[10] LAMPS evolved in the late 1960s from an urgent requirement to develop a manned helicopter that would support a non-aviation ship and serve as its tactical Anti-Submarine Warfare arm. Known as LAMPS Mark I, the advanced sensors, processors, and display capabilities aboard the helicopter enabled ships to extend their situational awareness beyond the line-of-sight limitations that hamper shipboard radars and the short distances for acoustic detection and prosecution of underwater threats associated with hull-mounted sonars. H-2s reconfigured for the LAMPS mission were redesignated *SH-2D*.\*[10] On 16 March 1971, the first SH-2D LAMPS prototype first flew.\*[11]

The full LAMPS I system was equipped on the *SH-2F*. The SH-2F was delivered to the Navy beginning in 1973. This variant had upgraded engines, longer life rotor, and higher take-off weight. In 1981, the Navy ordered 60 production SH-2Fs. Beginning in 1987, 16 SH-2Fs were upgraded with chin mounted Forward Looking Infrared Sensors (FLIR), Chaff (AIRBOC)/Flares, dual rear mounted IR scramblers, and Missile/Mine detecting equipment.\*[12]

Eventually all but two H-2s then in Navy inventory were remanufactured into SH-2Fs. The final production procurement of the SH-2F was in Fiscal Year 1986. The last six orders for production SH-2Fs were switched to the SH-2G Super Seasprite variant.\*[12]

### 9.1.2 Operational history

#### United States

The UH-2 began entering operational service in 1962.\*[3] The Navy soon found the helicopter's capabilities to be restricted by its single engine, and ordered Kaman to retrofit all of its Seasprites with a twin-engine arrangement instead; with two engines the Seasprite was capable of reaching an airspeed of 130 knots and operating at a range of up to 411 nautical miles.\*[2] The

Navy would operate a total fleet of nearly 200 Seasprites for various duties, such as anti-submarine warfare (ASW), search and rescue (SAR) and transportation.\*[2] Typically, several UH-2s would be deployed upon an aircraft carrier to perform plane guard and SAR missions.\*[10]

The UH-2 was introduced in time to see action in the Tonkin Gulf incident in August 1964; the Seasprite's principal contribution to what would become the Vietnam War was the retrieval of downed aircrews, both from the sea and from inside enemy territory, and was increasingly relied upon in this mission as the war intensified, such as during Operation Rolling Thunder in 1965.\*[13] In October 1966 alone, out of 269 downed pilots, helicopter-based SAR teams were able to recover 103 men.\*[14]



A UH-2A on plane guard duty hovers over the USS Kitty Hawk in March 1966

In the 1970s, the conversion of UH-2s to the SH-2 anti-submarine configuration provided the US Navy with its first ASW helicopter capable of operating from vessels other than its aircraft carriers. The small size of the SH-2 allowed it to be operated from flight decks that were too small for most helicopters, this being a factor in the Navy's decision to acquire the improved SH-2F in the early 1980s.\*[15]

SH-2Fs were utilized to enforce and support Operation Earnest Will in July 1987, Operation Praying Mantis in

April 1988, and Operation Desert Storm during January 1991 in the Persian Gulf region.\* [16] The countermeasures and additional equipment on the SH-2F allowed it to conduct combat support and surface warfare missions in these hostile environments, which had an often-minimal threat from submarines. The SH-2F was retired from active service in October 1993, at roughly the same time that the Navy retired the last of its Vietnam-era Knox Class Frigates that were unable to accommodate the larger SH-60 Sea Hawk.

In 1991, the US Navy began to receive deliveries of the new SH-2G Super Seasprite; a total of 18 converted SH-2Fs and 6 new-built SH-2Gs were produced.\* [17] These were assigned to Naval Reserve squadrons, the SH-2G entered service with HSL-84 in 1993.\* [18] The SH-2 served in some 600 deployments and flew 1.5 million flight hours before the last of the type were finally retired in mid-2001.\* [18]\* [19]

## New Zealand

The Royal New Zealand Navy (RNZN) replaced its Westland Wasps with four\* [20] interim SH-2F Seasprites (ex-US Navy), operated and maintained by a mix of Navy and Air Force personnel known as No. 3 Squadron RNZAF Naval Support Flight, to operate with ANZAC class frigates until the fleet of five new SH-2G Super Seasprites were delivered. The Navy air element was transferred to No. 6 Squadron RNZAF at RNZAF Base Auckland in Whenuapai in October 2005. RNZN Seasprites have seen service in East Timor. Six additional SH-2Fs rejected by the Royal Australian Navy\* [21] were purchased and are now stationed at the RNZAF Ground Training Wing (GTW) at Woodbourne near Blenheim as training helicopters. An SH-2F (ex-RNZN, NZ3442) is preserved in the Royal New Zealand Air Force Museum, donated to the museum by Kaman Aircraft Corporation after an accident while in service with the RNZN.

## Exports

In the late 1990s the United States offered surplus U.S. Navy SH-2Fs as foreign aid to a number of countries, Greece which had been offered six and Turkey which had been offered 14 rejected the offer.\* [22]\* [23] Egypt acquired four SH-2F aircraft under the aid program mainly for spares to support a fleet of ten SH-2Gs.\* [23] Poland acquired the later SH-2G.\* [23]

### 9.1.3 Variants

**YHU2K-1** Four test and evaluation prototypes powered by an 875-shp General Electric T58-GE-6 turboshaft engine. Later redesignated YUH-2A in 1962.\* [1]



The Vietnam War-era HH-2C Combat search and rescue version



A YSH-2E "LAMPS II" prototype approaching USS Fox (CG-33), 1971.

**HU2K-1** Utility transport helicopter, powered by a 1,250-shp (932-kW) General Electric T58-GE-8B turboshaft engine. Initial production version. Later redesignated UH-2A in 1962. 88 built.\* [1]

**UH-2B** Utility transport helicopter, same as UH-2A without IFR instruments, although these were later added without a subsequent change to the designation, 102 built.

**H-2 "Tomahawk"** A gunship version based on UH-2A. One prototype was built and tested for the U.S. Army in 1963. The Army selected it in November 1963, but the planned order for 220 H-2s was forsaken for additional UH-1 orders.\* [24]

**UH-2C** UH-2A and UH-2B helicopters fitted with two General Electric T58-GE-8B turboshaft engines.\* [1] One former UH-2A acted as a prototype and was followed by 40 conversions from UH-2A and UH-2B.

**NUH-2C** One test and evaluation helicopter. One UH-2C helicopter was modified with stub-wings and pylons for weapons trials, missiles fitted included the AIM-9 Sidewinder and AIM-7 Sparrow III air-to-air missiles.\* [1]

**NUH-2D** Redesignation of the NUH-1C test and evaluation helicopter.\* [1]

**HH-2C** Search and rescue helicopter, armed with a single **Minigun** in a chin-mounted turret and two waist mounted 7.62mm machine guns, six conversions.\*[1]

**HH-2D** Search and rescue helicopter, without any armament or armor but fitted with T58-GE-8F engines and four-bladed tail rotor, 67 conversions from UH-2A and UH-2Bs.\*[1]

**SH-2D** Anti-submarine warfare helicopter, 20 conversions from earlier models.\*[1]

**YSH-2E** Two test and evaluation helicopters, fitted with an advanced radar and LAMPS equipment.\*[1]

**SEALITE** Intended as the definitive version of the Seasprite for the LAMPS program. A 'lightweight' design for use on naval destroyers and escort vessels which had helicopter deck loading limits of about 6,000 lb (2,720 kg). Was to utilize the dynamic system of the basic UH-2 helicopter, but with a small, lighter fuselage, new skid landing gear, two Pratt & Whitney (UACL) PT6 (T400-CP-400) turboshaft engines and a three-blade folding rotor with a new rotor hub to keep the maximum gross weight at 7,900 lb (3,583 kg). Planned in three variants, ASW, CMD (Cruise Missile Defense, i.e. anti-ASM), and General Purpose.\*[25]\*[26] The company designation for the SEALITE was K-820. Due to post-Vietnam cutbacks, the SH-2F was ultimately procured instead.\*[27]

**SH-2F** Anti-submarine warfare helicopter, powered by two 1,350 shp (1,007 kW) General Electric T58-GE-8F turboshaft engines. Improved version. Conversions from SH-2Ds and earlier models.

**YSH-2G** 1 SH-2G prototype converted from an SH-2F.

**Kaman SH-2G Super Seasprite** Anti-submarine warfare helicopter, powered by two 1,723 shp (1,285 kW) General Electric T700-GE-401 turboshaft engines.

#### 9.1.4 Operators

For operators of SH-2G and its versions, see **Kaman SH-2G Super Seasprite**.



- Royal New Zealand Air Force\*[28]
- No. 6 Squadron RNZAF



- United States Navy\*[29]

#### 9.1.5 Aircraft on display

- The only remaining U.S. Navy HH-2D, bureau number 149031 / callsign "Copyright 14", is currently on display outside at the American Helicopter Museum & Education Center in West Chester, Pennsylvania.\*[30]
- An SH-2F is on display at the **USS Alabama** (BB-60) Battleship Memorial Park in Mobile, Alabama. The helicopter bears the markings of squadron HSL-31 ("Arch Angels"). It is supposed to be the first SH-2F delivered to the Navy in 1973.
- An SH-2F, bureau number unknown, is on outside display at the National Museum of Naval Aviation on board Naval Air Station Pensacola, Florida.\*[31]
- An SH-2F is on outside display at the intersection of Tow Way Road and Quentin Roosevelt Blvd aboard Naval Air Station North Island, Coronado, California.\*[32]
- An SH-2F is preserved in the Royal New Zealand Air Force Museum.\*[33]
- SH-2F, bureau number 151321 is currently on display at the Evergreen Aviation & Space Museum in McMinnville, Oregon.
- SH-2F, bureau number 149021 is currently on display on board the **USS Hornet** Museum at Alameda Point, California.\*[34]
- SH-2G, bureau number 162576 is currently on display at the Wings of Freedom Aviation Museum, NASJRB Willow Grove, Pennsylvania.\*[35]
- SH-2F, bureau number 161905 is currently on display at the New England Air Museum, located at Bradley International Airport in Windsor Locks, Connecticut.\*[36]
- SH-2F bureau number 162583 HSL-36 "Lamp-lighter 342" is on display at the Aviation Challenge Camp at the U.S. Space and Rocket Center in Huntsville, Alabama.
- An SH-2F bureau number 150155 is on display at the Pima Air and Space Museum in Tucson, Arizona

For SH-2G and its versions on display, see **Kaman SH-2G Super Seasprite**.

#### 9.1.6 Specifications

##### UH-2A

*Data from Carrier Aviation Air Power Directory\**[37]

##### General characteristics

- **Length:** 52 ft 2 in (15.90 m)
- **Rotor diameter:** 44 ft 0 in (13.41 m)
- **Height:** 13 ft 6 in (4.11 m)
- **Disc area:** 1520.53 sq ft (141.26 sq m)
- **Empty weight:** 6,100 lb (2,767 kg)
- **Max. takeoff weight:** 10,200 lb (4,627 kg)
- **Powerplant:** 1 × General Electric T58-GE-8B turboshaft, 1,525 shp (1,137 kW)
- **Rotor systems:** 4 blades on main rotor and 3 on tail rotor

## Performance

- **Never exceed speed:** 150 knots (278 km/h, 173 mph)
- **Maximum speed:** 141 knots (162 mph, 261 km/h)
- **Cruise speed:** 120 knots (138 mph, 222 km/h)
- **Range:** 582 nmi (670 mi, 1,080 km)
- **Service ceiling:** 17,400 ft (5,305 m)

## SH-2F

*Data from The Encyclopedia of World Military Aircraft\**[38]

### General characteristics

- **Crew:** 3 (Pilot, Co-pilot/Tactical Coordinator (TACCO), Sensor Operator (SENSO))
- **Length:** 52 ft 7 in (15.9 m)
- **Rotor diameter:** 44 ft 0 in (13.41 m)
- **Height:** 15 ft 6 in (4.72 m)
- **Disc area:** 1520.53 sq ft (141.26 sq m)
- **Empty weight:** 7,040 lb (3,193 kg)
- **Max. takeoff weight:** 12,800 lb (5,805 kg)
- **Powerplant:** 2 × General Electric T58-GE-8F turboshaft, 1,350 shp (1,007 kW) each
- **Rotor systems:** 4 blades on main rotor and tail rotor

## Performance

- **Maximum speed:** 143 knots (165 mph, 265 km/h)
- **Cruise speed:** 130 knots (150 mph, 241 km/h)
- **Range:** 366 nmi (422 mi, 679 km)

- **Service ceiling:** 22,500 ft (6,860 m)
- **Rate of climb:** ft/min (m/s)

## Armament

- **Hardpoints:** 2× side fuselage mounting stub/pylon stations
- **Missiles:** Non-US aircraft carry a variety of guided missiles, including the AGM-65 Maverick (often used in the anti-ship role) and dedicated anti-ship missiles.
- **Torpedoes:** 2× Mk 46 or Mk 50 ASW torpedoes

## 9.1.7 See also

### Related development

- Kaman SH-2G Super Seasprite

### Aircraft of comparable role, configuration and era

- Sikorsky SH-60 Seahawk
- Westland Lynx

### Related lists

- List of military aircraft of the United States

## 9.1.8 References

### Notes

- [1] Donald, David ed. "Kaman H-2 Seasprite", *The Complete Encyclopedia of World Aircraft*. Barnes & Noble Books, 1997. ISBN 0-7607-0592-5.
- [2] McGowen 2005, p. 60.
- [3] Apostolo, G. *The Illustrated Encyclopedia of Helicopters*. Bonanza Books, 1984. ISBN 0-517-43935-2.
- [4] Pattillo 2001, p. 211.
- [5] Soward 1995, pp. 169–171.
- [6] Soward 1995, pp. 244–246.
- [7] Soward 1995, pp. 261–262.
- [8] Pattillo 2001, p. 312.
- [9] Lehman 2001, p. 183.
- [10] Frawley 2002, p. 100.
- [11] Pattillo 2001, pp. 312–313.

- [12] Eden 2004, p. 219.
- [13] Dunstan 2003, p. 152.
- [14] Hearn 2005, p. 255.
- [15] Boyne 2002, p. 343.
- [16] Chant 2001, p. 54.
- [17] Endres and Gething 2005, p. 492.
- [18] *Jane's Aircraft Upgrades*. Jane's Information Group, 2009. (subscription article) posted 20 March 2009.
- [19] Stephens, Ernie. "Putting the "Super" in the Kaman Super Seasprite". *Rotor & Wing*, 1 October 2009.
- [20] "<http://www.adf-serials.com/nz-serials/nz3441.shtml>". *New Zealand military Aircraft Serials*. External link in title= (help);
- [21] "Seasprite helicopter project approved". *Media release*. beehive.govt.nz. 19 April 2013. Retrieved 15 July 2014.
- [22] "Greece and Turkey: U.S Assistance Programs and Other Activities".
- [23] "Canberra bough unwanted helicopters". 28 April 2004.
- [24] Harding, Stephen. *Kaman H-2 Tomahawk and Seasprite" . U.S. Army Aircraft Since 1947*. Schiffer Publishing Ltd., 1997. ISBN 0-7643-0190-X.
- [25] Flying Review International, May 1970
- [26] Soviet Naval Digest. Number 8, 1972
- [27] *Flight*, August 1971
- [28] "RNZAF – 6 Squadron". Royal New Zealand Air Force. Retrieved 2008-08-25.
- [29] "US Navy SH-2 Seasprite". globalsecurity.org. Retrieved 26 January 2013.
- [30] "kaman" . American Helicopter Museum & Education Center. Retrieved 2011-05-17.
- [31] "Aircraft on Display (H-M)". National Museum of Naval Aviation. Retrieved 2011-05-17.
- [32] "SH-2F on display, NAS North Island – Ray Trygstad's Maps" . Ray Trygstad. Retrieved 2011-05-17.
- [33] "Aircraft on Display" . Royal New Zealand Air Force Museum. Retrieved 2011-05-17.
- [34] "SH-2 SEASPRITE HELICOPTER" . USS Hornet Museum. Retrieved 2011-05-17.
- [35] "Kaman SH-2G "Sea Sprite"". Wings of Freedom Aviation Museum. Retrieved 2011-05-17.
- [36] "Kaman SH2-F 'Seasprite'" New England Air Museum Retrieved: 22 June 2012
- [37] Donald and March 2001, p. 52.
- [38] Donald and Lake 2000, p. 215.

## Bibliography

- Andrade, John M. *U.S. Military Aircraft Designations and Serials since 1909*. Midland Counties Publications, England, 1979. ISBN 0-904597-22-9.
- Boyne, Walter J. *Air Warfare: an International Encyclopedia: A-L*. ABC-CLIO, 2002. ISBN 1-576073-45-9.
- Chant, Chris. *Air War in the Gulf 1991*. Osprey Publishing, 2001. ISBN 1-841762-95-4.
- Cordesman, Anthony H. *Arab-Israeli Military Forces in an Era of Asymmetric Wars*. Greenwood Publishing, 2006. ISBN 0-275991-86-5.
- Donald, David; Daniel J. March (2001). *Carrier Aviation Air Power Directory*. Norwalk, CT: AIRtime Publishing. ISBN 1-880588-43-9.
- Donald, David; Jon Lake (2000). *The Encyclopedia of World Military Aircraft*. New York: Barnes & Noble. ISBN 0-7607-2208-0.
- Dunstan, Simon. *Vietnam Choppers*. Osprey Publishing, 2003. ISBN 1-841767-96-4.
- Endres, Günter., Michael J. Gething. *Jane's Aircraft Recognition Guide*. HarperCollins, UK, 2005. ISBN 0-007183-32-1.
- Eden, Paul. "Kaman SH-2 Seasprite", *Encyclopedia of Modern Military Aircraft*. Amber Books, 2004. ISBN 1-904687-84-9.
- Frawley, Gerard. *The International Directory of Military Aircraft*. Aerospace Publications, 2002. ISBN 1-875671-55-2.
- Hearn, Chester G. *Carriers in Combat: The Air War at Sea*. Greenwood Publishing, 2005. ISBN 0-275985-57-1.
- Lehman, John F. *Command of the Seas*. Naval Institute Press, 2001. ISBN 1-557505-34-9.
- McGowen, Stanley S. *Helicopters: An Illustrated History Of Their Impact*. ABC-CLIO, 2005. ISBN 1-851094-68-7.
- Pattillo, Donald M. *Pushing the Envelope: The American Aircraft Industry*. University of Michigan Press, 2001. ISBN 0-472086-71-5.
- Soward, Stuart E. *Hands to Flying Stations, a Recollective History of Canadian Naval Aviation, Volume II*. Victoria, British Columbia: Neptune Developments, 1995. ISBN 0-9697229-1-5.

### 9.1.9 External links

- Kaman Aerospace Seasprite page (manufacturer)
- SH-2 Seasprite on GlobalSecurity.org
- SH-2F Seasprite on Naval Officer Ray Trygstad's site
- Kaman SH-2 Seasprite on Kiwi Aircraft Images site
- Seasprite Central

## 9.2 Sikorsky SH-60 Seahawk

“SH-60” redirects here. For other uses, see [SH60 \(disambiguation\)](#).

This article is about the naval versions and operators of the S-70 family. For an overview of the S-70 family, and for its civilian models and operators, see [Sikorsky S-70](#).

The **Sikorsky SH-60/MH-60 Seahawk** (or **Sea Hawk**) is a twin turboshaft engine, multi-mission United States Navy helicopter based on the United States Army UH-60 Black Hawk and a member of the [Sikorsky S-70 family](#). The most significant airframe modification is a hinged tail to reduce its footprint aboard ships.

The U.S. Navy uses the H-60 airframe under the model designations **SH-60B**, **SH-60F**, **HH-60H**, **MH-60R**, and **MH-60S**. Able to deploy aboard any air-capable [frigate](#), [destroyer](#), [cruiser](#), [fast combat support ship](#), [amphibious assault ship](#), or [aircraft carrier](#), the Seahawk can handle anti-submarine warfare (ASW), anti-surface warfare (ASUW), naval special warfare (NSW) insertion, search and rescue (SAR), combat search and rescue (CSAR), vertical replenishment (VERTREP), and medical evacuation (MEDEVAC). All Navy H-60s carry a rescue hoist for SAR/CSAR missions.

### 9.2.1 Design and development

#### Origins

During the 1970s, the U.S. Navy began looking for a new helicopter to replace the [Kaman SH-2 Seasprite](#).<sup>[3]</sup> The SH-2 Seasprite was used by the Navy as its platform for the [Light Airborne Multi-Purpose System \(LAMPS\)](#) Mark I avionics suite for maritime warfare and a secondary search and rescue capability. Advances in sensor and avionic technology lead to the LAMPS Mk II suite, but the SH-2 was not large enough to carry the Navy's required equipment. In the mid-1970s, the Army evaluated the [Sikorsky YUH-60](#) and [Boeing-Vertol YUH-61](#) for its Utility Tactical Transport Aircraft System (UT-TAS) competition.<sup>[4]</sup>

The Navy based its requirements on the Army's UT-TAS specification to decrease costs from commonality.<sup>[3]</sup> Sikorsky and Boeing-Vertol submitted proposals for Navy versions of their Army UT-TAS helicopters in April 1977 for review. The Navy also looked at helicopters being produced by Bell, Kaman, Westland and MBB, but these were too small for the mission. In early 1978 the Navy selected Sikorsky's S-70B design,<sup>[3]</sup> which was designated “SH-60B Seahawk” .

#### SH-60B Seahawk

The SH-60B maintained 83% commonality with the UH-60A.<sup>[5]</sup> The main changes were corrosion protection, more powerful T700 engines, single-stage oleo main landing gear, removal of the left side door, adding two weapon pylons, and shifting the tail landing gear 13 feet (3.96 m) forward to reduce the footprint for shipboard landing. Other changes included larger fuel cells, an electric blade folding system, folding horizontal stabilators for storage, and adding a 25-tube pneumatic sonobuoy launcher on left side.<sup>[6]</sup> An emergency flotation system was originally installed in the stub wing fairings of the main landing gear; however, it was found to be impractical and possibly impede emergency egress, and thus was subsequently removed. Five YSH-60B Seahawk LAMPS III prototypes were ordered. The first YSH-60B flight occurred on 12 December 1979. The first production SH-60B made its first flight on 11 February 1983. The SH-60B entered operational service in 1984 with first operational deployment in 1985.<sup>[4]</sup>



A Seahawk hovers during a simulated casualty evacuation as MARSOC operators carry a stretcher.

The SH-60B is deployed primarily aboard [frigates](#), [destroyers](#), and [cruisers](#). The primary missions of the SH-60B are surface warfare and anti-submarine warfare. It carries a complex system of sensors including a towed [Magnetic Anomaly Detector \(MAD\)](#) and air-launched sonobuoys. Other sensors include the APS-124 search radar, ALQ-142 ESM system and optional nose-mounted forward looking infrared (FLIR) turret. Munitions carried include the Mk 46, Mk 50, or Mk 54 torpedo, AGM-114 Hellfire missile, and a single cabin-door-mounted

M60D/M240 7.62 mm (0.30 in) machine gun or **GAU-16** .50 in (12.7 mm) machine gun.

A standard crew for a SH-60B is one pilot, one ATO/Co-Pilot (Airborne Tactical Officer), and an enlisted aviation warfare systems operator (sensor operator). Operating squadrons are designated Helicopter Anti-Submarine Squadron, Light (HSL).

The SH-60J is a version of the SH-60B for the **Japan Maritime Self-Defense Force**. The SH-60K is a modified version of the SH-60J. The **SH-60J** and **SH-60K** are built under license by **Mitsubishi** in Japan.\*[7]\*[8]

### SH-60F

After the SH-60B entered service, the Navy began development of the SH-60F to replace the **SH-3 Sea King**.\*[9] Development of this variant began with the award of a contract to Sikorsky in March 1985. An early-model SH-60B (Bu. No. 161170) was modified to serve as a SH-60F prototype.\*[10] The company was contracted to produce seven SH-60Fs in January 1986 and the first example flew on 19 March 1987.\*[11]

The SH-60F primarily serves as the carrier battle group's primary **antisubmarine warfare** (ASW) aircraft. The helicopter hunts submarines with its **AQS-13F** dipping sonar, and carries a 6-tube sonobuoy launcher. The SH-60F is unofficially named "Oceanhawk".\*[11] The SH-60F can carry **Mk 46**, **Mk 50**, or **Mk 54** torpedoes for its offensive weapons, and it has a choice of fuselage-mounted machine guns, including the M60D, M240D, and **GAU-16** (.50 caliber) for self-defense. The standard aircrew consists of one pilot, one co-pilot, one tactical sensor operator (TSO), and one acoustic sensor operator (ASO).

### HH-60H



An **HH-60H Seahawk** deploying a SAR swimmer

The HH-60H was developed in conjunction with the US Coast Guard's **HH-60J**, beginning in September 1986 with a contract for the first five helicopters. The variant's first flight occurred on 17 August 1988. Deliveries

of the HH-60H began in 1989. The variant earned initial operating capability in April 1990.\*[11] The HH-60H's official DoD and Sikorsky name is *Seahawk*, though it has been called "Rescue Hawk".\*[12]

Based on the SH-60F, the HH-60H is the primary combat search and rescue (CSAR), naval special warfare (NSW) and anti-surface warfare (ASUW) helicopter. It carries various defensive and offensive sensors, it is one of the most survivable helicopters in the world. Sensors include a **FLIR** turret with laser designator and the Aircraft Survival Equipment (ASE) package including the **ALQ-144** Infrared Jammer, **AVR-2** Laser Detectors, **APR-39(V)2** Radar Detectors, **AAR-47** Missile Launch Detectors and **ALE-47** chaff/flare dispensers. Engine exhaust deflectors provide infrared thermal reduction reducing the threat of heat-seeking missiles. The HH-60H can carry up to four **AGM-114** Hellfire missiles on an extended wing using the M299 launcher and a variety of mountable guns including M60D, M240, **GAU-16** and **GAU-17/A** machine guns.

The HH-60H's standard crew is pilot, copilot, an enlisted crew chief, and two door gunners. The HH-60H is operated by Helicopter Antisubmarine (HS) squadrons with a standard dispersal of four F-models and three H-models. In Iraq, HH-60Hs were used by the Navy, assisting the Army, for **MEDEVAC** purposes and special operations missions. As the Navy transitions its Helicopter Antisubmarine (HS) squadrons to the MH-60S, remaining HH-60Hs are being transferred to its East and West coast special operations squadrons (**HSC-84** and **HSC-85**, respectively).

### MH-60R



An **MH-60R Seahawk** conducts sonar operations.

The MH-60R was originally known as "LAMPS Mark III Block II Upgrade" when development began in 1993. Two SH-60Bs were converted by Sikorsky, the first of which made its maiden flight on 22 December 1999. Designated YSH-60R, they were delivered to NAS Patuxent River in 2001 for flight testing. The production variant

was redesignated MH-60R to match its multi-mission capability.\* [13]

The MH-60R is designed to combine the features of the SH-60B and SH-60F.\* [14] Its sensors include the ASE package, MTS-FLIR, the AN/APS-147 multi-mode radar/IFF interrogator,\* [15] an advanced airborne fleet data link, and a more advanced airborne active sonar. It does not carry the MAD suite. Pilot instrumentation is based on the MH-60S's glass cockpit, using several digital monitors instead of the complex array of dials and gauges in Bravo and Foxtrot aircraft. Offensive capabilities are improved by the addition of new Mk-54 air-launched torpedoes and Hellfire missiles. All Helicopter Anti-Submarine Light (HSL) squadrons that receive the Romeo are redesignated Helicopter Maritime Strike (HSM) squadrons.\* [16] During a mid-life technology insertion project, the MH-60R fleet shall be fitted with the AN/APS-153 Multi-Mode Radar with Automatic Radar Periscope Detection and Discrimination (ARPDD) capability.\* [17]

### MH-60S



An MH-60S lifting humanitarian supplies from the deck of USNS Comfort in Haiti 2010

The Navy decided to replace its venerable CH-46 Sea Knight helicopters in 1997. After sea demonstrations by a converted UH-60, the Navy awarded production contract for the CH-60S in 1998. The variant first flew in 27 January 2000 and it began flight testing later that year. The CH-60S was redesignated MH-60S in February 2001 to reflect its planned multi-mission use.\* [18] The MH-60S is based on the UH-60L and has many naval SH-60 features.\* [19] Unlike all other Navy H-60s, the MH-60S is not based on the original S-70B/SH-60B platform with its forward-mounted twin tail-gear and single starboard sliding cabin door. Instead, the S-model is a hybrid, featuring the main fuselage of the S-70A/UH-60, with large sliding doors on both sides of the cabin and a single aft-mounted tail wheel; and the engines, drivetrain and rotors of the S-70B/SH-60.\* [20]\* [21]

It is deployed aboard aircraft carriers, amphibious assault

ships, Maritime Sealift Command ships, and fast combat support ships. Its missions include vertical replenishment, medical evacuation, combat search and rescue, anti-surface warfare, maritime interdiction, close air support, intelligence, surveillance and reconnaissance, and special warfare support. The MH-60S is to deploy with the AQS-20A Mine Detection System and an Airborne Laser Mine Detection System (ALMDS) for identifying submerged objects in coastal waters. It is the first US Navy helicopter to field a glass cockpit, relaying flight information via four digital monitors. The primary means of defense is with the M60D, M240 or GAU-17/A machine guns. A "batwing" Armed Heli Kit based on the Army's UH-60L was developed to accommodate Hellfire missiles, Hydra 70 2.75 inch rockets, or larger guns. The MH-60S can be equipped with a nose mounted forward looking infrared (FLIR) turret to be used in conjunction with Hellfire missiles; it also carries the ALQ-144 Infrared Jammer.



*MH-60S in East Timor*

The MH-60S is unofficially known as the "Knighthawk", referring to the preceding Sea Knight, though "Seahawk" is its official DoD name.\* [22]\* [23] A standard crew for the MH-60S is one pilot, one copilot and two others depending on mission. With the retirement of the Sea Knight, the squadron designation of Helicopter Combat Support Squadron (HC) was also retired from the Navy. Operating MH-60S squadrons were re-designated Helicopter Sea Combat Squadron (HSC).\* [16] The MH-60S was to be used for mine clearing from Littoral-combat ships, but testing found it lacks the power to safely tow the detection equipment.\* [24]

On 6 August 2014, the U.S. Navy forward deployed the Airborne Laser Mine Detection System (ALMDS) to the U.S. 5th Fleet. The ALMDS is a sensor system designed to detect, classify, and localize floating and near-surface moored mines in littoral zones, straits, and choke points. The system is operated from an MH-60S, which gives it a countermine role traditionally handled by the MH-53E Sea Dragon, allowing smaller ships the MH-53E can't operate from to be used in the role. The ALMDS beams a laser into the water to pick up reflections from things it bounces off of, then uses that data to produce a video image for technicians on the ground to determine if the

object is a mine.\*[25]

### 9.2.2 Operational history

#### U.S. Navy

The Navy received the first production SH-60B in February 1983 and assigned it to squadron HSL-41.\*[26]\*[27] The helicopter entered service in 1984,\*[28] and began its first deployment in 1985.\*[26]



*A MH-60R prepares to land aboard the USS John C. Stennis*

The SH-60F entered operational service on 22 June 1989 with Helicopter Antisubmarine Squadron 10 (HS-10) at NAS North Island.\*[18] SH-60F squadrons planned to shift from the SH-60F to the MH-60S from 2005 to 2011 and were redesignated Helicopter Sea Combat (HSC).\*[29]

As one of the two squadrons in the US Navy dedicated to Naval Special Warfare support and combat search and rescue, the HCS-5 Firehawks squadron deployed to Iraq for Operation Iraqi Freedom in March 2003. The squadron completed 900 combat air missions and over 1,700 combat flight hours. The majority of their flights in the Iraqi theater supported special operations ground forces missions.



*An MH-60R Seahawk firing a live Hellfire missile*

A west coast Fleet Replacement Squadron (FRS), Heli-

copter Maritime Strike Squadron (HSM) 41, received the MH-60R aircraft in December 2005 and began training the first set of pilots. In 2007, the R-model successfully underwent final testing for incorporation into the fleet. In August 2008, the first 11 combat-ready Romeos arrived at HSM-71, a squadron assigned to the carrier *John C. Stennis*. The primary missions of the MH-60R are anti-surface and anti-submarine warfare. According to Lockheed Martin, “secondary missions include search and rescue, vertical replenishment, naval surface fire support, logistics support, personnel transport, medical evacuation and communications and data relay.”\*[30]

HSL squadrons in the US have been incrementally transitioning to the MH-60R and have nearly completed the transition. The first MH-60Rs in Japan arrived in October 2012. The recipient was HSM-51, the Navy's forward deployed LAMPS squadron, homebased in Atsugi, Japan. The Warlords transitioned from the SH-60B throughout 2013, and shifted each detachment to the new aircraft as they returned from deployments. HSM-51 will have all MH-60R aircraft at the end of 2013. The Warlords are joined by the Sabrehawks of HSM-77, who will also fly the MH-60R in Japan.

On 23 July 2013, Sikorsky delivered the 400th MH-60, an MH-60R Seahawk, to the U.S. Navy. The Navy operates 166 MH-60R versions and 234 MH-60S versions. The MH-60S is in production until 2015 and will total a fleet of 275 aircraft, and the MH-60R is in production until 2017 and will total a fleet of 291 aircraft. The two models have flown 660,000 flight hours. Seahawk helicopters are to remain in Navy service into the 2030s.\*[31]

The SH-60B Seahawk completed its last active-duty deployment for the U.S. Navy in late April 2015 after a seven-month deployment aboard the *USS Gary (FFG-51)*. After 32 years and over 3.6 million hours of service, the SH-60B was formally retired from US Navy service during a ceremony on 11 May 2015 at Naval Air Station North Island.\*[32]\*[33] In late November 2015 the *USS Theodore Roosevelt (CVN-71)* returned from its deployment, ending the last active-duty operational deployment of both the SH-60F and HH-60H. The models are to be transferred to other squadrons or placed in storage.\*[34]

#### Other and potential users

Spain ordered 12 S-70B Seahawks for its Navy.\*[35] Spain requested six refurbished SH-60Fs through a Foreign Military Sale in September 2010.\*[36]\*[37]

Australia requested approval to buy 24 MH-60Rs through a Foreign Military Sale in July 2010.\*[38] The MH-60R and the NHIndustries NH90 were evaluated by the Royal Australian Navy. On 16 June 2011, it was announced that Australia would purchase 24 of the MH-60R variant, to come into service between 2014 to 2020.\*[39] The helicopter selected is to replace older Seahawks currently in service.\*[40]\*[41]



*The first two Australian MH-60Rs arriving at Naval Air Station Jacksonville shortly before being formally delivered to the Royal Australian Navy in December 2013*

The Royal Danish Navy (RDN) put the MH-60R on a short list for a requirement of around 12 new naval helicopters, together with the NH90/NFH, H-92, AW159 and AW101. The Request For Proposal was issued on 30 September 2010.\* [42] In November 2010, Denmark requested approval for a possible purchase of 12 MH-60Rs through a Foreign Military Sale.\* [43]\* [44] In November 2012, Denmark selected 9 MH-60Rs to replace its 7 aging Lynx helicopters.\* [45]

In July 2009, the Republic of Korea requested eight MH-60S helicopters, 16 GE T700-401C engines, and related sensor systems to be sold in a Foreign Military Sale.\* [46] However, South Korea instead chose the AW159 in January 2013.\* [47] In July 2010 Tunisia requested 12 refurbished SH-60Fs through a Foreign Military Sale.\* [48] But the change in government there in January 2011 may interfere with an order.\* [49]

In February 2011, India selected the S-70B over the NHIndustries NH90 for an acquisition of 16 multirole helicopters for the Indian Navy to replace its aging Westland Sea King fleet; the order include an option for 8 additional aircraft.\* [50] India selected the Seahawk and confirmed procurement in November 2014.\* [51]

In 2011, Qatar requested a potential Foreign Military Sale of up to 6 MH-60R helicopters, engines and other associated equipment.\* [52] In late June 2012, Qatar requested another 22 Seahawks, 12 fitted with the armed helicopter modification kit and T700-401C engines with an option to purchase an additional six Seahawks and more engines.\* [53]\* [54]

In 2011, Singapore bought six S-70Bs and then in 2013 ordered an additional two.\* [55]

In early 2015, Israel ordered 10 SH-60s due to the expansion of the Israeli Navy surface fleet.\* [56]

In 2015, Saudi Arabia requested the sale of ten MH-60R helicopters and associated equipment and support for the Royal Saudi Navy.\* [57]\* [58]

### 9.2.3 Variants

#### U.S. versions



*MH-60S empty cabin and sling load mechanism*



*HH-60H Rescue Hawk from HSC-84 at Balad Air Base in Iraq, 2008*



*View of front of MH-60R, 2010*

- **YSH-60B Seahawk:** Developmental version, led to SH-60B; five built.\* [59]
- **SH-60B Seahawk:** Anti-submarine warfare helicopter, equipped with an APS-124 search radar and an ALQ-142 ESM system under the nose, also fitted with a 25-tube sonobuoy launcher on the left side and modified landing gear; 181 built for the US Navy.

- **NSH-60B Seahawk:** Permanently configured for flight testing.\*[59]
- **CH-60E:** Proposed troop transport version for the U.S. Marine Corps. Not built.\*[60]
- **SH-60F "Oceanhawk":** Carrier-borne anti-submarine warfare helicopter, equipped with dipping sonar; 76 built for the U.S. Navy.\*[61]
- **NSH-60F Seahawk:** Modified SH-60F to support the VH-60N Cockpit Upgrade Program.\*[59]
- **HH-60H "Rescue Hawk":** Search-and-rescue helicopter for the U.S. Navy; 42 built.
- **XSH-60J:** Two U.S.-built pattern aircraft for Japan.
- **SH-60J:** Anti-submarine warfare helicopter for the Japanese Maritime Self-Defense Force.
- **YSH-60R Seahawk:**
- **MH-60R Seahawk:**
- **YCH-60S "Knighthawk":**
- **MH-60S "Knighthawk":**
- **HH-60/MH-60 Jayhawk:** U.S. Coast Guard version, developed from HH-60H.
- **S-70C:** Designation for civil variants of the H-60.
- **S-70C(M)-1/2 Thunderhawk:** Export version for the Republic of China (Taiwan) Navy, equipped with an undernose radar and a dipping sonar.
- **S-70C-2:** 24 radar-equipped UH-60 Black Hawks for China, the delivery of the helicopters was halted by an embargo.
- **S-70C-6 Super Blue Hawk:** Search-and-rescue helicopter for Taiwan, equipped with undernose radar, plus provision for four external fuel tanks on two sub wings.
- **S-70C-14: VIP transport version for Brunei;** two built.
- **S-70A (N) Naval Hawk:** Maritime variant that blends the S-70A Black Hawk and S-70B Seahawk designs.
- **S-70L:** Sikorsky's original designation for the SH-60B Seahawk.

#### 9.2.4 Operators



*Hellenic Navy S-70B-6 Aegean Hawk with Penguin missile*



*A JMSDF SH-60J lands onboard USS Russell (DDG 59)*

#### Australia

- Royal Australian Navy\*[62]



*MH-60S "Knighthawk" with tail and rotors folded on Mount Whitney*



**Brazil**

- Brazilian Navy\*[62]



**Colombia**

- Colombian Navy (2-4 on order)\*[63]



**Denmark**

- Danish Navy (9 on order)\*[62]



**Greece**

- Hellenic Navy\*[62]



**India**

- Indian Navy\*[64]



**Japan**

- See SH-60J/K



**Saudi Arabia**

- Royal Saudi Navy (10 on order)\*[65]



**Singapore**

- Republic of Singapore Navy\*[62]



- Spanish Navy\*[62]



**Taiwan (Republic of China)**

- Republic of China Navy\*[62]



**Thailand**

- Royal Thai Navy\*[62]



**Turkey**

- Turkish Naval Forces\*[62]

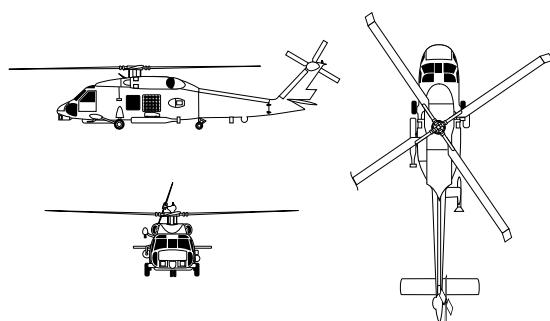


**United States**

- United States Navy\*[62]

### 9.2.5 Specifications (SH-60B)

*Data from Brassey's World Aircraft & Systems Directory,\*[66] Navy fact file,\*[22] and Sikorsky S-70B\*[67]\*[68]*



#### General characteristics

- **Crew:** 3-4
- **Capacity:** 5 passengers in cabin, slung load of 6,000 lb (2,700 kg) or internal load of 4,100 lb (1,900 kg) for B, F and H models; and 11 passengers or slung load of 9,000 lb (4,100 kg) for S-model
- **Length:** 64 ft 8 in (19.75 m)

- **Rotor diameter:** 53 ft 8 in (16.35 m)
- **Height:** 17 ft 2 in (5.2 m)
- **Disc area:** 2,262 ft<sup>2</sup> (210 m<sup>2</sup>)
- **Empty weight:** 15,200 lb (6,895 kg)
- **Loaded weight:** 17,758 lb (8,055 kg) ; for ASW mission
- **Useful load:** 6,684 lb (3,031 kg)
- **Max. takeoff weight:** 21,884 lb (9,927 kg)
- **Powerplant:** 2 × General Electric T700-GE-401C turboshaft, 1,890 shp (1,410 kW) take-off power each

### Performance

- **Never exceed speed:** 180 kn (333 km/h; 207 mph)
- **Maximum speed:** 146 kn (270 km/h; 168 mph)
- **Range:** 450 nmi (518 mi or 834 km) at cruise speed
- **Service ceiling:** 12,000 ft (3,580 m)
- **Rate of climb:** 1,650 ft/min (8.38 m/s)

### Armament

- Up to three Mark 46 torpedoes or Mk-54s,
- AGM-114 Hellfire missile, 4 Hellfire missiles for SH-60B and HH-60H and MH-60R, 8 Hellfire missiles for MH-60S Block III.
- AGM-119 Penguin missile (being phased out),
- M60 machine gun or, M240 machine gun or GAU-16/A machine gun or GAU-17/A Minigun
- Rapid Airborne Mine Clearance System (RAMICS) using Mk 44 Mod 0 30 mm Cannon

Main article: U.S. Helicopter Armament Subsystems

### 9.2.6 See also

- List of United States Navy aircraft squadrons

### Related development

- Sikorsky S-70
- Sikorsky UH-60 Black Hawk
- Sikorsky HH-60 Pave Hawk

- Sikorsky HH-60 Jayhawk
- Mitsubishi H-60
- Piasecki X-49
- Sikorsky S-92/CH-148 Cyclone

### Aircraft of comparable role, configuration and era

- Boeing-Vertol YUH-61
- Eurocopter AS565 Panther
- Kaman SH-2G Super Seasprite
- Kamov Ka-27
- Harbin Z-9
- NHI NH90
- Westland Lynx

### Related lists

- List of Sikorsky S-70 Models
- List of helicopters
- List of active United States military aircraft

### 9.2.7 References

#### Notes

- [1] "MH-60R Selected Acquisition Report (SAR)" (pdf). US Department of Defense. 31 December 2011. p. 11. Retrieved 2013-04-27.
- [2] "MH-60S Selected Acquisition Report (SAR)" (pdf). US Department of Defense. 31 December 2011. p. 14. Retrieved 2013-04-27.
- [3] Leoni 2007, pp. 203–4.
- [4] Sikorsky S-70B Seahawk, Vectorsite.net, 1 July 2006.
- [5] Eden, Paul. "Sikorsky H-60 Black Hawk/Seahawk", Encyclopedia of Modern Military Aircraft, p. 431. Amber Books, 2004. ISBN 1-904687-84-9.
- [6] Leoni 2007, pp. 206–9.
- [7] Mitsubishi (Sikorsky) SH-60J (Japan). Jane's, 17 April 2007.
- [8] Mitsubishi SH-60K Upgrade. Jane's, 11 June 2008. Archived March 5, 2009 at the Wayback Machine
- [9] Leoni 2007, p. 211.
- [10] "Bureau (Serial) Numbers of Naval Aircraft" (PDF).
- [11] Donald 2004, p. 158.

- [12] SH-60 Multipurpose Helicopter at Aerospaceweb.org
- [13] Donald 2004, pp. 161-162.
- [14] Donald 2004, p. 161.
- [15] “MH-60R Equipment Guide” . *Military.com*. Retrieved 4 December 2012.
- [16] *Airscoop*, US Navy, 2003, retrieved 2011-06-30
- [17] “Telephonics to supply AN/APS-153 radars for US MH-60R aircraft” . *Naval Technology*. 26 April 2012. Retrieved 4 December 2012.
- [18] Donald 2004, pp. 159-160.
- [19] Donald 2004, pp. 160-161.
- [20] *MH-60S Knighthawk — Multi-Mission Naval Helicopter*, USA, Naval Technology, retrieved 2008-10-05
- [21] Air Cache: MH-60 KnightHawk
- [22] *SH-60 Seahawk fact file*, US Navy, retrieved 2008-10-05
- [23] Sikorsky SH-60 Seahawk helicopter, Fact File. Sikorsky. checked 2008-10-05 Archived September 24, 2008 at the Wayback Machine
- [24] LaGrone, Sam. “MH-60S underpowered for MCM towing operations, report finds.” Jane's Information Group, 21 January 2013.
- [25] U.S. Navy deploys its new Airborne Laser Mine Detection System (ALMDS) for the first time - *Navyrecognition.com*, 6 August 2014
- [26] Donald 2004, pp. 156–157.
- [27] Tomajczyk 2003, p. 55.
- [28] Leoni 2007, p. 205.
- [29] Helicopter Sea Combat Wing, Pacific. GlobalSecurity.org
- [30] “MH-60R Helicopter Departs Lockheed Martin To Complete First Operational Navy Squadron” . Lockheed Martin, July 30, 2008.
- [31] Sikorsky Delivers 400th MH-60 SEAHAWK Helicopter to U.S. Navy - *Marketwatch.com*, 23 July 2013
- [32] Alford, Abbie (11 May 2015). “Navy retires the SH-60B Seahawk” . San Diego: CBS 8.
- [33] USS Gary Returns From Final Deployment; Also Last for SH-60B Seahawks - *News.USNI.org*, 20 April 2015
- [34] Carrier Theodore Roosevelt returns from round-the-world deployment - *Navytimes.com*, 23 November 2015
- [35] Leoni 2007, pp. 303-304.
- [36] “Spain – Refurbishment of SH-60F Multi-Mission Utility Helicopters” . US Defense Security Cooperation Agency, 30 September 2010.
- [37] “Spain seeks more Seahawk helicopters” . Retrieved 2010-10-07.
- [38] “Australia – MH-60R Multi-Mission Helicopters” . US Defense Security Cooperation Agency, 9 July 2010.
- [39] Australian Broadcasting Corporation Online, 16 June 2011
- [40] “Australia requests US helicopters” . Rotothub, 29 April 2010.
- [41] “MH-60R or NH90 NFH - Australia plans to buy 24 naval combat helicopters” . Defpro.com, 29 April 2010.
- [42] Danish Request For Proposal. *forsvaret.dk*
- [43] “Denmark – MH-60R Multi-Mission Helicopters” . US Defense Security Cooperation Agency, 30 November 2010.
- [44] Hoyle, Craig. “Denmark requests Seahawk helicopter buy” . Flightglobal.com, 13 December 2010. Retrieved: 14 December 2010.
- [45] Hoyle, Craig. “Denmark confirms MH-60R selection to replace Lynx helicopters” . Flightglobal.com, 21 November 2012. Retrieved: 21 November 2012.
- [46] “Korea – MH-60S Multi-Mission Helicopters” . US Defense Security Cooperation Agency, 22 July 2009.
- [47] “South Korea picks AW159 for maritime helicopter deal” . *Flight International*, 15 January 2013.
- [48] “Tunisia – Refurbishment of Twelve SH-60F Multi-Mission Helicopters” . US Defense Security Cooperation Agency, 2 July 2010.
- [49] SH-60F Seahawk Helis for Tunisia
- [50] “India to go for open bidding for Navy deal, rejects US offer” . Economic Times, 18 February 2011.
- [51] <http://www.janes.com/article/45511/indian-mod-opts-for-seahawk-in-navy-s-mrh-tender>
- [52] [http://www.dsca.mil/PressReleases/36-b/2011/Qatar\\_11-26.pdf](http://www.dsca.mil/PressReleases/36-b/2011/Qatar_11-26.pdf)
- [53] “Qatar – MH-60R and MH-60S Multi-Mission Helicopters” . US Defense Security Cooperation Agency, 28 June 2012.
- [54] Sambridge, Andy (30 June 2012). “Qatar keen on \$2.5bn US helicopters deal” . ArabianBusiness.com. Retrieved 1 July 2012.
- [55] Waldron, Gregg (February 20, 2013). “Singapore orders two additional S-70B helicopters” . Flightglobal. Retrieved February 2, 2015.
- [56] [http://www.mako.co.il/news-military/security-q1\\_2015/Article-638696a9a9c9b41004.htm](http://www.mako.co.il/news-military/security-q1_2015/Article-638696a9a9c9b41004.htm)
- [57] [http://www.defense-aerospace.com/articles-view/release/3/163865/us-approves-\protect\\\_\\\_unadd\\_text\\_character:nN{\textdollar}\\\$\\\$1.9bn-sale-of-mh\\_60r-helicopters-to-saudi-arabia.html](http://www.defense-aerospace.com/articles-view/release/3/163865/us-approves-\protect\_\_unadd_text_character:nN{\textdollar}\$\$1.9bn-sale-of-mh_60r-helicopters-to-saudi-arabia.html)
- [58] <http://www.dsca.mil/major-arms-sales/kingdom-saudi-arabia-mh-60r-multi-mission-helicopters>

- [59] DoD 4120-15L, *Model Designation of Military Aerospace Vehicles*. US DoD, 12 May 2004.
- [60] Donald, David, ed. "Sikorsky S-70". *The Complete Encyclopedia of World Aircraft*. Barnes & Noble Books, 1997. ISBN 0-7607-0592-5.
- [61] "S-60B (SH-60B Seahawk, SH-60F CV, HH-60H Rescue Hawk, HH-60J Jayhawk, VH-60N) - Sikorsky Archives". Sikorsky Aircraft.
- [62] World Air Forces 2014 "World Air Forces 2014" Check lurl= value (help) (PDF). Flightglobal Insight. 2014. Retrieved 11 March 2014.
- [63] <http://www.planobrazil.com/confirmado-colombia-anuncia-que-usara-o-helicóptero-seahawk-para-combate-a-missões-de-sigilo-e-reconhecimento>
- [64] <http://www.sikorsky.com/pages/AboutSikorsky/PressreleaseDetails.aspx?pressreleaseid=278>
- [65] <http://www.janes.com/article/56741/saudi-arabia-signs-for-10-mh-60r-helos>
- [66] Taylor, M J H (editor) (1999), *Brassey's World Aircraft & Systems Directory 1999/2000 Edition*, Brassey's, ISBN 1-85753-245-7
- [67] S-70B Seahawk Technical Information, 2001.
- [68] S-70B Seahawk Mission Brochure. Sikorsky.com.

## Bibliography

- A1-H60CA-NFM-000 NATOPS Flight Manual Navy Model H-60F/H Aircraft
- Donald, David ed. "Sikorsky HH/MH/SH-60 Seahawk". *Warplanes of the Fleet*. AIRtime, 2004. ISBN 1-880588-81-1.
- Leoni, Ray D. *Black Hawk, The Story of a World Class Helicopter*. American Institute of Aeronautics and Astronautics, 2007. ISBN 978-1-56347-918-2.
- Tomajczyk, Stephen F. *Black Hawk*. MBI, 2003. ISBN 0-7603-1591-4.

## 9.2.8 External links

- S-70B Seahawk page on Sikorsky.com
- SH-60 fact file and SH-60 history page on US Navy site
- SH-60, HH-60H, MH-60S pages on Globalsecurity.org

## 9.3 Penguin (missile)

The **Penguin** anti-ship missile, designated **AGM-119** by the U.S. military, is a Norwegian passive IR seeker-based short-to-medium range anti-ship guided missile, designed for naval use.

### 9.3.1 Overview

Penguin was originally developed in a collaboration between the Norwegian Defence Research Establishment (NDRE; Norw. *FFI*) and Kongsberg Våpenfabrikk<sup>\*</sup>[1] starting in the early 1960s, with financial support from the USA and West Germany. US Navy test facilities and technical assistance were made available to facilitate development.<sup>\*</sup>[2] It was the first NATO AShM with an IR seeker (instead of the commonly used active radar technology) and both hardware and software has been updated since entering series production in 1972.

Initial installation was in 500 kg deck-mounted box launchers with snap open doors. These were designed for minimal deck intrusion, so as to be retrofitted to existing small ships. The first such installations were on Snogg- and Storm-class FPBs of the Norwegian Navy. The first airborne installations were on F-104Gs of the Norwegian Air Force, the missiles being fitted to standard Bullpup rails on the two underwing hardpoints.

Fire-control was provided by a Kongsberg SM-3 computer which could cue the missiles based on either active radar or passive ESM data.<sup>\*</sup>[3]

The Penguin can be fired singly or in coordinated-arrival salvos. Once launched the launching craft is free to turn-away as the missile is inertially guided until the autonomous terminal homing phase. Propelled by a solid rocket engine, latest variants of Penguin can perform random weaving manoeuvres at target approach and strike the target close to the waterline.

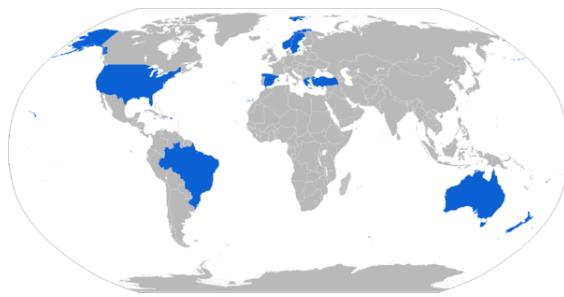
Of NATO's inventory of such missiles, it is the only variant that performs a terminal bunt and weave manoeuvre (although the US Harpoon missile retains its ability to execute a terminal bunt). The 120 kg warhead (originally based on that of the Bullpup ASM built under license by Kongsberg) detonates inside the target ship by using a delay fuze. The MK3 when launched from high altitudes can initially act as a glidebomb, only firing its rocket engine to extend range, or ideally to achieve maximum speed before hitting the target; for better penetration.

In its various versions, the Penguin can be launched from a number of different weapons platforms:

- Surface vessels: Missile boats (its initial application) as well as larger ships
- Fighter aircraft: certified for F-16
- Helicopters (certified for the following aircraft):
  - Bell 412 SP
  - Kaman SH-2 Seasprite
  - Sikorsky S-70 series (SH-60 Seahawk, UH-60 Black Hawk)
  - Westland Super Lynx

KDA's successor to the Penguin is the Naval Strike Missile (NSM), offered from 2007 onwards. NSM features an imaging IR-seeker, GPS navigation, a turbojet sustainer engine (for much longer ranges: 150+ km), and significantly more computer performance and digital signal processing power.

### 9.3.2 Operators



Map with Penguin operators in blue

#### Current operators

- **Brazil:** Acquired for use in Brazilian Navy's S-70B helicopters at a cost of €33 million\* [4]\*[5]
- **Greece:** In service with the Hellenic Navy (since 1980)
- **Norway:** In service with both the Royal Norwegian Navy (since 1972) and Royal Norwegian Air Force (since 1989)
- **Spain:** In service with the Spanish Navy (since 2003)
- **Sweden:** In service with the Swedish Navy (since 1980)~as **Robotystem 12**.
- **Turkey:** In service with the Turkish Navy (since 1972)
- **United States:** In service with the United States Navy as the **AGM-119** (since 1994)
- **New Zealand:** In service with the Royal New Zealand Navy Purchased the Royal Australian Navy's cancelled Super Seasprite helicopters, including Penguin Mk 2 Mod 7 missiles and simulator.\* [6]\*[7]

### 9.3.3 Notes

- [1] Kongsberg Defence & Aerospace (KDA) was formerly a part of *Kongsberg Våpenfabrikk (KV)* (1814–1986) and *Norsk Forsvarsteknologi (NFT)* (1987–1994), and is now part of *Kongsberg Gruppen (KOG)*.

- [2] Bill Gunston, *Illustrated Encyclopaedia of Rockets and Missiles*, Salamander Books, 1979
- [3] Jane's Weapon Systems, 1970 - 71
- [4] Diário Oficial da União
- [5] Rolleiv Solholm (2 October 2012). “*Kongsberg to deliver missiles to Brazil*” . *The Norway Post*. Retrieved 7 October 2012.
- [6] “*Royal New Zealand Navy selects KONGSBERGs Penguin anti-ship missile for Seasprite helicopters*” . November 29, 2013.
- [7] Solholm, Rolleiv (3 December 2013). “*New Zealand selects Norwegian made anti-ship missile*” . *The Norway Post*. Retrieved 7 December 2013.

### 9.3.4 External links

- Official Penguin webpage (KDA)
- Penguin Anti-Ship Missile
- Missile.index search – Choose\* **Development-Country:** “Norway”, then pick “Penguin” from the results list  
(\* direct linking to subpages is not possible at this website)

## 9.4 AGM-114 Hellfire

The **AGM-114 Hellfire** is an air-to-surface missile (ASM) first developed for anti-armor use, but later models were developed for precision strikes against other target types, such as, in the case of a Predator drone, high-value target, usually by the United States or other western nations. It was originally developed under the name *Helicopter Launched, Fire and Forget Missile*, which led to the colloquial name 'Hellfire' ultimately becoming the missile's formal name.\* [2] It has multi-mission, multi-target precision-strike ability, and can be launched from multiple air, sea, and ground platforms. The Hellfire missile is the primary 100-pound (45 kg) class air-to-ground precision weapon for the armed forces of the United States and many other nations.

### 9.4.1 Description

The Hellfire can be deployed from rotary- and fixed-wing aircraft, waterborne vessels and land-based systems against a variety of targets.

The development of the Hellfire Missile System began in 1974 with the U.S. Army requirement for a "tank-buster", launched from helicopters to defeat armored fighting vehicles.\* [3]\*[4] Production of the AGM-114A started in 1982. The Development Test and Evaluation (DT&E)

launch phase of the AGM-114B took place in 1984. The DT&E on the AGM-114K was completed in Fiscal Year (FY)93 and FY94. AGM-114M did not require a DT&E because it is the same as the AGM-114K except for the warhead. Most variants are **laser guided** with one, AGM-114L “Longbow Hellfire”, being **radar guided**.<sup>\*[5]\*[6]</sup> Laser guidance can be provided either from the launcher, such as the nose-mounted opto-electronics of the **AH-64 Apache** attack helicopter, other airborne target designators or from ground-based observers, the latter two options allowing the launcher to break line of sight with the target and seek cover.<sup>\*[7]</sup>



*Cockpit video showing the missile being used in Afghanistan against two people on a road.*

The Hellcat, developed in the early 1990s is a modular missile system with several variants. Hellcat II's semi-active laser variants—AGM-114K **high-explosive anti-tank** (HEAT), AGM-114KII with external blast fragmentation sleeve, AGM-114M (blast fragmentation), and AGM-114N **metal augmented charge** (MAC)—achieve pinpoint accuracy by homing in on a reflected laser beam aimed at the target. Predator, Reaper and **AH 665 Tiger**, **UCAVs** carry the Hellcat II, but the most common platform is the **AH-64 Apache** helicopter gunship, which can carry up to 16 of the missiles at once. The AGM-114L, or Longbow Hellcat, is a fire-and-forget weapon: equipped with a millimeter wave (MMW) radar seeker, it requires no further guidance after launch—even being able to lock-on to its target after launch<sup>\*[8]</sup>—and can hit its target without the launcher or other friendly unit being in line of sight of the target. It also works in adverse weather and battlefield obscurants, such as smoke and fog which can mask the position of a target or prevent a designating laser from forming a detectable reflection. Each Hellcat weighs 47 kilograms (104 lb), including the 9 kilograms (20 lb) warhead, and has a range of 8,000 metres (26,000 ft). The AGM-114R “Romeo” Hellcat II entered service in late 2012. It uses a semi-active laser homing guidance system and an integrated blast fragmentation sleeve warhead to engage targets that previously needed multiple Hellcat variants. It will replace AGM-114K, M, N, and P variants in U.S. service.<sup>\*[9]</sup> In October 2012, the

U.S. ordered 24,000 Hellcat II missiles, for both the U.S. armed forces and foreign customers.<sup>\*[10]</sup>

The **Joint Common Missile** (JCM) was to replace Hellcat II (along with the **AGM-65 Maverick**) by around 2011. The JCM was developed with a tri-mode seeker and a multi-purpose warhead that would combine the capabilities of the several Hellcat variants. In the budget for FY2006, the **U.S. Department of Defense** canceled a number of projects that they felt no longer warranted continuation based on their cost effectiveness, including the JCM. A possible new JCM successor called the **Joint Air to Ground Missile** (JAGM) is under consideration. Due to budget reductions, JAGM development was separated into increments, with Increment 1 focusing on adding a millimeter wave radar to the Hellcat-R to give it a dual-mode seeker, enabling it to track moving targets in bad weather.<sup>\*[11]\*[12]</sup>

#### 9.4.2 Operation history

Since being fielded, Hellcat missiles have been used in combat in **Operation Just Cause** in Panama, **Operation Desert Storm** in Persian Gulf, **Operation Allied Force** in Yugoslavia, **Operation Enduring Freedom** in Afghanistan, in **Operation Iraqi Freedom**, where they have been fired from **Apache** and **Super Cobra** attack helicopters, **Kiowa** scout helicopters, and **Predator** unmanned combat air vehicles (UCAVs).

The only known operational air-to-air kill with a Hellcat took place on 24 May 2001. A civilian **Cessna 152** aircraft entered Israeli airspace from **Lebanon**, with unknown intentions and refusing to answer or comply with **ATC** repeated warnings to turn back. An **Israeli Air Force AH-64A** helicopter fired upon the Cessna, resulting in its complete disintegration,<sup>\*[13]</sup> and the death of Estephan Nicolai, a student pilot.<sup>\*[14]</sup>

In 2008, the usage of the AGM-114N variant caused controversy in the United Kingdom when it was reported that these **thermobaric** munitions were added to the British Army arsenal. Thermobaric weapons have been condemned by human rights groups.<sup>\*[15]</sup> The **UK Ministry of Defence** refers to the AGM-114N as an “enhanced blast weapon”.<sup>\*[15]</sup>

The AGM-114 has been the munition of choice for airborne targeted killings that have included high-profile figures such as **Ahmed Yassin** (Hamas leader) in 2004 by the **Israeli Air Force**,<sup>\*[16]\*[17]</sup> **Anwar al-Awlaki** (American-born Islamic cleric and Al Qaeda in the Arabian Peninsula leader) in Yemen in 2011,<sup>\*[18]</sup> **Abu Yahya al-Libi** in Pakistan in 2012 by the United States, and **Moktar Ali Zubeyr** (also known as Ahmad Abdi Godane, leader of al-Shabaab) in Somalia in September 2014.<sup>\*[19]</sup> US officials are 99% confident that on 12 November 2015, **Jihadi John**, real name Mohammed Emwazi, was killed by a drone-fired Hellcat missile, while travelling in a car near Clocktower Square, in

Raqqa, Syria, the place where ISIL carry out public executions.\* [20]

In January 2016 the *Wall Street Journal* reported that one training missile without a warhead was accidentally shipped to Cuba in 2014 after a training mission in Europe and until now has not been returned.\* [21] A US official said that this was an inert “dummy” version of the Lockheed system, known as a “Captive Air Training Missile”. It is stripped of its warhead, fuse, guidance equipment and motor.\* [22]\*[23]

### 9.4.3 Variants

#### AGM-114A Basic Hellfire

- Target: Tanks, armored vehicles.
- Range: 8,000 m (8,750 yd)
- Guidance: Semi-active laser homing (SALH).
- Warhead: 8 kg (18 lb) shaped charge HEAT.
- Length: 163 cm (64 in)
- Weight: 45 kg (99 lb)

#### AGM-114B/C Basic Hellfire

- M120E1 low smoke motor.
- AGM-114B has electronic SAD (Safe/Arming Device) for safe shipboard use.
- Unit cost: \$25,000

#### AGM-114D/E Basic Hellfire

- Proposed upgrade of AGM-114B/C with digital autopilot—not built.

#### AGM-114F Interim Hellfire

- Target: Tanks, armored vehicles.
- Range: 7,000 m (7,650 yd)
- Guidance: Semi-active laser homing.
- Warhead: 9 kg (20 lb) tandem shaped charge HEAT.
- Length: 180 cm (71 in)
- Weight: 48.5 kg (107 lb)

#### AGM-114G Interim Hellfire

- Proposed version of AGM-114F with SAD—not built.

#### AGM-114H Interim Hellfire

- Proposed upgrade of AGM-114F with digital autopilot—not built.

#### AGM-114J Hellfire II

- Proposed version of AGM-114F with lighter components, shorter airframe, and increased range—not built.

#### AGM-114K Hellfire II



A Hellfire II exposed through transparent casing.

- Target: All armored threats
- Range: 8,000 m (8,749 yd)
- Guidance:
  - Semi-active laser homing with electro-optical countermeasures hardening
  - Digital autopilot improvements allow target reacquisition after lost laser lock
- New electronic SAD
- Warhead: 9 kg (20 lb) tandem shaped charge HEAT
- Length: 163 cm (64 in)
- Weight: 45.4 kg (100 lb)
- Unit cost: \$65,000
- Essentially the proposed AGM-114J w/ SAD

#### AGM-114L Longbow Hellfire

- Target: All armored threats
- Range: 8,000 m (8,749 yd)
- Guidance:
  - Fire and forget millimeter wave radar seeker coupled with inertial guidance
  - Homing capability in adverse weather and the presence of battlefield obscurants

- Warhead: 9 kg (20 lb) tandem shaped charge **high explosive anti-tank** (HEAT)
- Length: 176 cm (69.2 in)
- Weight: 49 kg (108 lb)
- Weight: 50 kg (110 lb)
- Speed: Mach 1.3
- Unit Cost: \$99,600 (All-Up Round, 2015 USD)\*[25]

### AGM-114M Hellfire II

- Target: **Bunkers**, light vehicles, **urban** (soft) targets and caves
- Range: 8,000 m (8,749 yd)
- Guidance:
  - Semi-active laser homing
- Warhead: Blast fragmentation/incendiary
- Weight: 48.2 kg (106 lb)
- Length: 163 cm (64 in)

### AGM-114N Hellfire II

- Target: Enclosures, ships, urban targets, air defense units
- Range: 8,000 m (8,749 yd)
- Guidance:
  - Semi-active laser homing
- Warhead: Metal augmented charge (MAC) (Thermobaric)
- Weight: 48 kg (105 lb)
- Length: 163 cm (64 in)

### AGM-114P Hellfire II

- Version of AGM-114K optimized for use from **UCAVs** flying at high altitude.

### ATM-114Q Hellfire II

- Practice version of AGM-114N with inert warhead.

### AGM-114R Hellfire II (Hellfire Romeo)\*[24]

- Target: All Target Types
- Range: 8,000 m (8,749 yd)
- Guidance:
  - Semi-active laser homing
- Warhead: Multi-function warhead

### AGM-114S Hellfire II

- Practice version of AGM-114K with a spotting charge instead of a warhead.

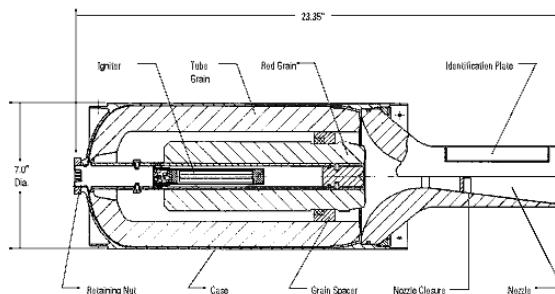
### AGM-114T Hellfire II

- AGM-114R with insensitive munition rocket motor and electromagnetic control actuators.

### M36 Captive Flight Training Missile

The M36 is an inert device used for training the handling of the Hellfire. It includes an operational laser seeker.\*[26]

#### 9.4.4 Rocket motor



*Cross section diagram of Hellfire rocket motor, showing the rod and tube grain design.*

- Contractor: **Alliant Techsystems**
- Designation:
  - M120E3 (Army)
  - M120E4 (Navy)
- Main features:
  - Qualified minimum smoke propellant
  - Rod and tube grain design
  - Neoprene bondline system
- Performance:
  - Operating temperature: -43 °C to 63 °C (-45 °F to 145 °F)
  - Storage temperature: -43 °C to 71 °C (-45 °F to 160 °F)

- Service life: 20+ years (estimated)
- Technical data:
  - Weight: 14.2 kg (31.3 lb)
  - Length: 59.3 cm (23.35 in)
  - Diameter: 18 cm (7.0 in)
  - Case: 7075-T73 aluminum
  - Insulator: R-181 aramid fiber-filled EPDM
  - Nozzle: Cellulose phenolic
  - Propellant: Minimum smoke cross linked double based (XLDB)

#### 9.4.5 Launch vehicles and systems

##### Manned helicopters



*Iraqi Air Force AC-208 Cessna Caravan launches a Hellfire missile*



*Hellfire loaded onto the rails of a United States Marine Corps AH-1W Super Cobra at Balad Air Base in Iraq in 2005.*

- AH-1W SuperCobra
- AH-1Z Viper
- AH-64 Apache
- Agusta A129 Mangusta
- Eurocopter Tiger
- SH-60, MH-60R, MH-60S Seahawk
- OH-58D Kiowa Warrior
- RAH-66 Comanche

- AH-6 Little Bird
- UH-60 Blackhawk
- Westland WAH-64 Apache

##### Fixed-wing aircraft

- Beechcraft Super King Air<sup>\*</sup>[27]
- AC-208 Combat Caravan<sup>\*</sup>[28]
- KC-130J Harvest HAWK<sup>\*</sup>[29]
- A-29 Super Tucano
- Air Tractor AT-802U
- AC-130W<sup>\*</sup>[30]



*Predator launching a Hellfire missile*

##### Unmanned aircraft

- MQ-1B Predator
- MQ-9 Reaper
- Predator C
- MQ-1C Gray Eagle

##### Manned boat

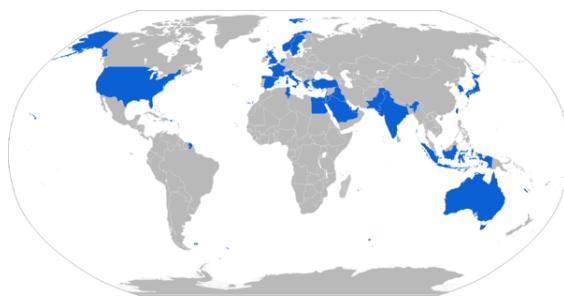
- Combat Boat 90
- Super Dvora Mk III-class patrol boat

##### Experimental platforms

The system has been tested for use on the Humvee and the Improved TOW Vehicle (ITV). Test shots have also been fired from a C-130 Hercules. Sweden and Norway use the Hellfire for coastal defense, and has conducted tests with Hellfire launchers mounted on the Combat Boat 90 coastal assault boat.<sup>\*</sup>[31]

The US Navy is evaluating the missile for use on the littoral combat ship.<sup>\*</sup>[32] The missile will be tested on the LCS in 2014.<sup>\*</sup>[33]

#### 9.4.6 Operators



Map with Hellfire operators in blue

The following nations use the Hellfire:<sup>\*</sup>[34]

- Australia
- Egypt
- France
- Greece
- India
- Indonesia
- Iraq
- Israel
- Italy
- Jordan
- Japan
- Kuwait
- Lebanon<sup>\*[35]</sup>
- Netherlands
- Norway
- Pakistan
- Qatar
- Republic of Korea
- Saudi Arabia
- Singapore
- Spain
- Sweden
- Taiwan (Republic of China)
- Tunisia<sup>\*[36]</sup>

- Turkey
- United Arab Emirates
- United Kingdom
- United States

#### 9.4.7 See also

- Joint Air-to-Ground Missile
- Brimstone (missile)
- Mokopa
- AGM-169 Joint Common Missile
- HOT (missile)
- Spike (missile)
- PARS 3 LR
- HJ-10
- List of missiles
- United States Army Aviation and Missile Command
- AN/PAQ-1
- Direct Attack Guided Rocket
- Mizrak-U
- AGM-176 Griffin
- Targeted killing
- Deh Bala wedding party airstrike

#### 9.4.8 References

- [1] AGM-114 Hellfire Variants. GlobalSecurity.org, 25 November 2005. Retrieved 14 August 2009.
- [2] “AGM-114 Hellfire missile.” Boeing, Retrieved 3 July 2013.
- [3] John Pike. “AGM-114 Hellfire Modular Missile System (HMMS)”. Retrieved 6 February 2015.
- [4] Introduction of the Hellfire – A Revolutionary Weapon to defeat the Soviet Armor Threat – Official US Army video at Real Military Flix
- [5] “Longbow Hellfire” . Retrieved 27 September 2011.
- [6] “AGM-114L Longbow Missile” . (shows that the L variant is called Longbow). Retrieved 27 September 2011.
- [7] “AGM-114 Hellfire Modular Missile System (HMMS)”. Retrieved 27 September 2011.
- [8] “AGM-114L Longbow Missile” . Retrieved 27 September 2011.

- [9] Army and Lockheed Martin prepare for production of advanced laser-guided Hellfire missile - Militaryaerospace.com, 10 April 2012
- [10] Hella Lotta Hellfires - Strategypage.com, October 19, 2012
- [11] Army Reduces Scope Of Tri-Mode JAGM - Aviationweek.com, 27 August 2012
- [12] Hellfire Replacement Step Closer With Draft JAGM RFP, Aviationweek.com, 10 June 2014
- [13] "מטוס ספנה לבוני הופל מעל מכמורת - חדשת". ynet. Retrieved 6 February 2015.
- [14] "Israel shoots down Lebanese civilian plane". CNN. May 2001.
- [15] Smith, Michael (22 June 2008). "Army 'vacuum' missile hits Taliban". *The Times* (London). Retrieved 22 June 2008.
- [16] Whitaker, Brian (23 March 2004). "Assassination method: surveillance drone and a Hellfire missile". *The Guardian* (London). Retrieved 4 December 2010.
- [17] "The Life And Death Of Shaikh Yasin". Al Jazeera. 25 March 2004. Archived from the original on 16 August 2007. Retrieved 20 October 2010.
- [18] Kasinoff, Laura; Mazzetti, Mark; Cowell, Alan (30 September 2011). "U.S.-Born Qaeda Leader Killed in Yemen". *The New York Times*.
- [19] Martinez, Michael (5 September 2014). "Top Somali militant killed in U.S. operation, Pentagon says". CNN. Retrieved 5 September 2014.
- [20] "How the US and UK tracked down and killed Jihadi John". *Telegraph*. 13 November 2015.
- [21] Devlin Barrett, Gordon Lubold. "Missing U.S. Missile Shows Up in Cuba." *The Wall Street Journal*, January 8, 2016.
- [22] "Dummy US missile disappears, turns up in Cuba". *Yahoo News*. 8 January 2016.
- [23] "Hellfire Missile Wrongly Sent To Cuba Was Inert, U.S. Official Says". *NPR.org*. 8 January 2016.
- [24] "Lockheed Martin Distribution Statement" (PDF). US Army. Retrieved 20 August 2015.
- [25] "AGM-114 Hellfire Missile". AeroWeb.
- [26] John Pike. "FM 1-140 Chapter 5". GlobalSecurity.org.
- [27] "US sends Hellfire missiles to Iraq". *Belfast Telegraph* (Independent News & Media). 27 December 2013. Retrieved 27 December 2013.
- [28] "New Iraqi Airborne Strike Capability Spotted". Aviation Week & Space Technology. 14 October 2008. Retrieved 20 May 2010.
- [29] KC-130J Harvest Hawk takes on new role in Afghanistan - DVIDS
- [30] "The U.S. Air Force's New AC-130 Gunships Are Really Bomb Trucks". FoxTrot Alpha. 1 June 2014. Retrieved 5 September 2014.
- [31] Norwegian article about the experimental deployment of Hellfire missiles on coastal patrol boats (from the official web site of the Norwegian Armed Forces)
- [32] Muñoz, Carlo (14 January 2014). "SNA 2014: Navy Won't Rule Out Army Longbow Hellfire for LCS". news.usni.org. U.S. Naval Institute. Retrieved 14 January 2014.
- [33] Osborn, Kris (9 April 2014). "Navy Adds Hellfire Missiles to LCS". www.dodbuzz.com. Retrieved 9 April 2014.
- [34] "AGM-114 Hellfire and Longbow Hellfire", *Jane's Weapon Systems, Vol. I: Air-Launched*, March 19, 2013.
- [35] "Heavy U.S. Military Aid to Lebanon Arrives ahead of Elections". Naharnet Newsdesk. 9 April 2009. Retrieved 9 April 2009.
- [36] "Proposed Foreign Military Sale to Tunisia".

#### 9.4.9 External links

- AGM-114 Hellfire—Federation of American Scientists (FAS)
- HELLFIRE II Missile—Lockheed Martin
- LONGBOW FCR and LONGBOW HELLFIRE Missile—Lockheed Martin
- Designation Systems
- Global Security
- Archived copy of Navy Fact File
- Janes.com
- Hellfire Detailed Description and Images

#### 9.5 Helicopter deck

A **helicopter deck** (or **helo deck**) is a helicopter pad on the deck of a ship, usually located on the stern and always clear of obstacles that would prove hazardous to a helicopter landing. In the United States Navy, it is commonly and properly referred to as the **flight deck**.<sup>[1]</sup>

In the Royal Navy, *landing on* is usually achieved by first lining up on the port quarter parallel to the ship's heading, then once the deck motion is deemed to be acceptable the pilot sidesteps the aircraft laterally using a white painted line (the *bum line*) as a reference.

Shipboard landing for some helicopters is assisted through use of a haul-down device that involves attachment of a cable to a probe on the bottom of the aircraft prior to



A U.S. Navy SH-60 Sea Hawk helicopter prepares to lift off from the flight deck of an Arleigh Burke Class destroyer.

landing. Tension is maintained on the cable as the helicopter descends, assisting the pilot with accurate positioning of the aircraft on the deck; once on deck locking beams close on the probe, locking the aircraft to the flight deck. This device was pioneered by the Royal Canadian Navy and was called "Beartrap". The U.S. Navy implementation of this device, based on Beartrap, is called the "**RAST**" system (for Recovery Assist, Secure and Traverse) and is an integral part of the LAMPS Mk III (SH-60B) weapons system.\* [2]

A secondary purpose of the haul-down device is to equalize electrostatic potential between the helicopter and ship. The whirling rotor blades of a helicopter can cause large charges to build up on the airframe, large enough to cause injury to shipboard personnel should they touch any part of the helicopter as it approaches the deck. This was depicted in the 1990 film *The Hunt for Red October*, when Jack Ryan is flown out to a submarine by helicopter. Ryan is lowered to the submarine, but brushes the officer charged with trying to hook him who receives a minor injury.

Coaxial rotor helicopters in flight are highly resistant to side-winds, which makes them suitable for shipboard use, even without a rope-pulley landing system.

Marine and Offshore Helicopter decks on board offshore oil platforms and Ships are typically regulated by the rules defined within CAP 437, which defines standards for the design, marking, and lighting of Marine/offshore Helicopter decks, and is produced by the Civil Aviation Authority. The Largest Marine Heli decks will accommodate the Boeing CH-47 Chinook, which requires a D value of 30 metres (98 ft), and has a weight of 21.3 tons. More typical for vessels would be decks that will accommodate the Sikorsky S92 with a D value of 21 metres (69 ft) and 11.9 tons.

### 9.5.1 See also

- Naval aviation

- Helipad

### 9.5.2 References

- [1] "USS Dubuque Hosts Tiger Cruise Following Seven Month Deployment" *USN Press Release*, 16 December 2010
- [2] "AMERICAN CLEARANCE PROCESS" W. P. Geyer, Jr., K. Long, D. Carico Naval Air Systems Command

## 9.6 Beartrap (hauldown device)

The **beartrap** is the Canadian name of a device invented for smaller warships, like frigates and destroyers, that carry helicopters. While not essential to enable embarked helicopters to operate from small escort vessels, it enables them to operate in a wider range of weather conditions.\* [1]\* [2]

In the mid-1950s, navies of the world were faced with the challenge of how to land a large helicopter on a rolling, pitching flight deck of a smaller ship. The problem was solved in the early 1960s when the Royal Canadian Navy's Experimental Squadron 10 (VX 10), based at Shearwater, in collaboration with Dartmouth's Fairey Aviation, developed the world's first Helicopter Hauldown and Rapid Securing Device (HHRSD) or "beartrap". The CH-124 Sea King was the first Royal Canadian Navy helicopter to be equipped with this system.

To use the beartrap, a helicopter hovers over the landing pad on the deck and lowers a line with an attached probe on the end. This probe is attached by the deck crew to a heavier cable that passes through the center of the beartrap from a winch below the flight deck. The cable is pulled back up and secured to the helicopter. The pilot then increases power to balance the pull of the winch with the lift of the helicopter. This synchronizes the helicopter with the ship's movements and he is now in the "high hover" position. As the pilot decreases the power, the helicopter is slowly pulled by the winch to the "low hover" position just above the deck while maintaining sync with the ship. When the Landing Signals Officer (LSO) determines a quiescent moment is approaching he will instruct the pilot to land. He then closes the Beartrap to capture the helicopter's main probe, securing the aircraft to the flight deck. The tail is secured by a second probe.

Once secured and after straightening, the Beartrap is used to traverse the aircraft in and out of the hangar. This allows movement in and out of the hangar in more severe conditions than if it had to be towed in the conventional way.

The HHRSD was subsequently adopted by navies around the world, including the United States, Australia, and Japan, and is considered Canada's greatest contribution

to the advancement of naval aviation. Other navies use different helicopters aboard different escort ships with a broadly similar system of a probe or grappling device lowered on a steel cable into a flight deck grating, before winching itself down while secured to the deck of a pitching vessel in heavy seas.

### 9.6.1 References

- [1] "Background —CF Naval Helicopter —Sikorsky CH-124 Sea King". Canadian American Strategic Review. Archived from the original on 2008-06-17. Retrieved 2008-03-11.
- [2] "IROQUOIS class air defence destroyer (DDH)". Haze gray and underway. Retrieved 2008-03-11.

### 9.6.2 External links

- The Beartrap - A Canadian Invention - Crowsnest Magazine Article

# Chapter 10

## Armament

### 10.1 OTO Melara 76 mm

The **OTO Melara 76 mm** gun is a naval artillery piece built and designed by the Italian defence company **Oto Melara**. It is based on the Oto Melara 76/62C and evolved toward 76/62 SR and 76/62 Strales. The Oto Melara 76 mm Compatto cannon system is compact enough to be installed on relatively small warships, like **corvettes**, **avisos** (a vessel somewhere between a corvette, destroyers and a patrol boat), or **patrol boats**. The gun's high rate of fire and availability of specialised ammunition make it well-suited to varied roles such as short-range anti-missile point defence, anti-aircraft, anti-surface, and ground support. Specialised ammunition includes armour-piercing, incendiary, directed fragmentation effects, and a guided round marketed as capable of destroying manoeuvring anti-ship missiles. A stealth cupola is now offered.

The OTO Melara 76 mm has been widely exported, currently in use internationally by 60 navies. It has recently been favoured over the French 100mm naval gun for the joint French/Italian Horizon-class frigate project and FREMM frigate. On 27 September 2006 Iran announced it has started mass production of a marine artillery gun, named the **Fajr-27**, which is a reverse-engineered Oto Melara 76 mm gun.\*[1]

#### 10.1.1 Other specifications

- **Cooling:** sea water—fresh water for flushing
- **Electrical Power supply**
  - 440 V, 3-phase, 60 Hz, main circuit;
  - 115 V, 1-phase, 400 Hz, servo and synchro network

#### 10.1.2 Variants

##### Super Rapid

Developed in the early 1980s (and sometimes called the “Super Rapido”), this variant is the up-to-date development of rapid fire Italian 76 mm naval cannons, capable of firing an increased 120 rounds per minute. The Super

Rapid's higher rate of fire was achieved by designing a faster feed system.

**Strales system** These new improvements led to the Italian Navy preferring the Super Rapido with Strales System and DART ammunition to the Fast Forty 40 mm CIWS, in the anti-missile defence role, being capable of countering several subsonic missiles from 6,000 to 1,000 meters away. DART 76m had a longer range than other CIWS, but the Italian navy wanted an even longer range weapon.

The *Durand de la Penne* class was initially planned to carry four 40 mm Fast Forty dual turrets, but they were replaced by three 76 mm Super Rapido turrets. The longer range means one single gun can engage more than one missile in a single engagement, and minimises the danger posed by fragments and splinters if a missile is destroyed close to the ship. The 76 mm was also capable of being used versus surface targets, being a medium caliber gun with relatively long range.\*[2]

#### 10.1.3 Ammunition

To provide multiple roles for the gun, OTO provides the user with wide ranges of specialised ammunition.\*[3]

- **HE standard (all models):** weight 6.296 kg, range 16 km, effective 8 km (4 km vs. air targets at 85°)
- **MOM:** developed by OTO (Multirole OTO Munition)
- **PFF:** anti-missile projectile, with proximity fuse and tungsten balls embedded in the shell for defined fragmentation effect
- **SAPOM:** 6.35 kg (0.46 kg HE), range 16 km (SAPOMER: 20 km) semi-armoured piercing
- **DART:** guided projectile for anti-aircraft manoeuvring targets
- **Vulcano:** 5 kg, maximum range around 40 km (it is a smaller version of the 127 mm Vulcano)\*[4]

## Fire control system

There were evolutions in the gun's fire control systems as well. The early versions (Compatto) utilised radars such as the RTN-10X Orion (made by Selenia, now Selex);

From the early 1980s there was a more powerful and flexible system, the RTN-30X (used with the Dardo-E CIWS system and known within Italian Navy as SPG-73), that was capable to manage both guns (40/76 and 127 mm calibres) and missiles (Sea Sparrow-Aspide). This system came in service with the Italian Navy, on the cruiser *Garibaldi* (C551: the RTN-30X entered in service first with *Maestrale*-class frigates, but the Dardo 40 mm turret were slaved to the smaller and older RTN-20X radars), but still with the twin 40 mm Dardo's turrets; while the first ship equipped with Dardo E and 76 mm Super Rapido was the upgraded *Audace*-class destroyers, later followed by the *Durand de la Penne* class. The 76/62 has also been used with countless other fire control systems, when not being used in the Italian fleet.

## Fuses

There have been many developments in the fuses, essential to shoot down low-flying missiles. The best fuse developed for the 76/62 guns is arguably the 3A-Plus programmable multi-role fuse, manufactured by Oto Melara and Simmel Difesa, introduced in the early 2000s. This fuse requires the installation of a fuse programmer in the mount.

The programmable multi-role fuse offers the user different modes for excellent flexibility, including a time mode for air burst; proximity mode: including Gated Proximity, Anti-Missile Proximity, Conventional Air Defence Proximity and Anti-Surface Proximity Modes; and several different impact modes: including Delayed Impact.

The system includes a DSP which rejects ground/sea clutter and makes the fuse capable of detecting a missile flying as low as two meters above sea level. It has the capability to recognise a target at a 10-meter stand-off. In all, the fuse greatly increases the effectiveness of the gun when engaging anti-ship missiles.

## DART

Since the 1980s efforts were made for development of guided 76 mm ammunition, but this was not achieved until recently. The first such ammunition was the CCS (Course Corrected Shell), also known as 'CORRETTO'; a joint program of OTO and British Aerospace.<sup>\*[5]</sup> Work started in 1985. The projectile had several small rockets in order to deviate the trajectory. Radio commands were sent from the ship FCS. The FCS did not know the exact position of the projectile, only that of the target. This system was too complex and unreliable, so OTO studied

another development in order to obtain a real 'guided ammunition'.

The result of this development is a system which was called DAVIDE just for the Italian market and STRALES for export purposes while the fired guided ammunition is called DART(Driven Ammunition Reduced Time of flight).<sup>\*[5]</sup>

The DART projectile is similar in many aspects to other hyper-velocity systems, for example the Starstreak SAM missile's multi-dart warhead, but is a guided gun projectile with radio controls and a proximity fuse for low level engagement (up to 2 meters over the sea). DART is fired at 1,200 m/s (3,900 ft/s), can reach 5 km range in only 5 seconds, and can perform up to 40 manoeuvres. The DART projectile is made of two parts: the forward is free to rotate and has two small canard wings for flight control. The aft part has the 2.5 kg warhead (with tungsten cubes and the 3A millimetric wave new fuse), six fixed wings and the radio receivers.<sup>\*[5]</sup>

The guidance system is Command Line of Sight (CLOS). It uses a TX antenna installed on gun. The radio-command for them is provided on a broadcast data-link (Ka Band).<sup>\*[5]</sup>

The first lot of DART/STRALES 76mm guided ammunition, produced by OTO Melara, was successfully tested at the end of March, 2014. The firing trials were conducted on board one of the Italian Navy's ships equipped with Strales 76mm SR and Selex NA25 fire control system.<sup>\*[6]</sup> The first firing trials of the DART (Driven Ammunition Reduced Time of flight) ammunition bought by Colombia in 2012, were successfully conducted in the Caribbean Sea on August 29 from the 76/62 Strales inner-layer defence system fitted to its modernised FS 1500 Padilla-class frigates.<sup>\*[7]</sup>

## VULCANO

The more recent development is the VULCANO 76 ammunition system. Basically, it is a scaled down version of the 127–155 mm Vulcano family of extended-range projectiles developed by Oto Melara; guided by Inertial Navigation System and Global Positioning Systems, it is capable of hitting targets twice the distance of normal 76 mm gun ammunition.<sup>\*[8]</sup> GPS-IMU guidance and IR or SALT Terminal sensor<sup>\*[9]</sup>

## Other uses

Main article: [Rooikat](#)

Most of the basic ammunition types offered for the Oto Melara 76mm can also be fired from the South African *Rooikat* armoured car with slight modification to the percussion primers. This is the only land-based vehicle system capable of deploying the same ammunition as its

naval counterpart.\* [10]

#### 10.1.4 Users

Platforms using the Oto-Melara 76 mm include:

##### Asia

###### Vietnam

- SIGMA 9814 corvette - 1 x 2

###### Bangladesh

- Bangabandhu frigate - 1 x 1
- BNS Somudra Joy- 1 x 1

###### Indonesia

- *Van Speijk*-class frigate - 1 x 6
- Sigma-class corvette - 1 x 5
- Bung Tomo class corvette - 1 x 3

###### India

- *Kolkata*-class destroyer - 1 x 3
- *Godavari*-class frigate - 1 x 3
- *Brahmaputra*-class frigate - 1 x 3
- *Shivalik*-class frigate -
- *Kora*-class corvette -
- *Kamorta*-class corvette -
- *Veer*-class corvette -
- Vikrant Class Aircraft Carrier- 4 guns per ship

###### Iran

- *Kaman*-class missile boat

###### Israel

- *Sa'ar* 3-class missile boat
- *Sa'ar* 4-class missile boat



JMSDF's Asagiri-class destroyer - JS Setogiri (DD-156) showing off her main gun at maximum elevation of +85°.



Cartridge and case of the OTO Melara 76mm gun in Japanese service.

- *Sa'ar* 4.5-class missile boat

###### Japan

- *Hatsuyuki*-class destroyer
- *Asagiri*-class destroyer
- *Murasame*-class destroyer
- *Minegumo*-class destroyer(JDS Murakumo only)
- JDS *Ishikari*
- *Yubari*-class destroyer escort
- *Abukuma*-class destroyer escort

- *Hayabusa*-class patrol boat

### South Korea

- *Ulsan*-class frigate - 2 x 9
- *Pohang*-class corvette
- *Donghae*-class corvette
- *Gumdoksuri*-class patrol vessel

### Malaysia

- *Laksamana*-class corvette
- Kedah class Corvette

### Oman

- *Khareef*-class corvette

### Philippines

- *Gregorio del Pilar*-class frigate
- *Jacinto*-class corvette



The OTO Melara 76mm Super Rapide gun mounted on the Victory-class corvette - RSS Valour (89)

### Singapore

- *Endurance*-class landing platform dock
- *Formidable*-class frigate
- *Victory*-class corvette
- *Fearless*-class patrol vessel

### Sri Lanka

- *Nandimithra*-class missile boat

### Taiwan (Republic of China)

- *Cheng Kung*-class frigate
- *Kang Ding*-class frigate
- *Tuo Chiang* class corvette

### Thailand

- *Pattani*-class offshore patrol vessel
- *Ratanakosin*-class corvette
- *Ratcharit*-class missile boat
- *Chuburi*-class patrol boat
- *Tapi*-class corvette
- *Khamrongsin*-class corvette

### Turkey

- *Doğan*-class fast attack craft
- *Kılıç*-class fast attack craft
- *Kılıç-II*-class fast attack craft
- *Yıldız*-class fast attack craft
- G-class frigate
- *Milgem*-class corvette

### United Arab Emirates

- *Baynunah*-class corvette

### Lebanon

- Combattante FS56 - 1 x 3

**Africa** **Algeria**

- Kalaat Béni Abbès Class - 1 x 1
- 1 x Oto Melara 127/64 LW 127mm main gun for MEKO 200 \*[11]

 **Egypt**

- Ambassador MK III Missile Boat
- *Descubierta*-class corvette - Spanish built, 1 x 2
- *Oliver Hazard Perry*-class frigate
- *Ramadan*-class missile boat
- *Tiger*-class fast attack craft
- Gowind 2500 corvette - 1 x 4 \*[12]
- FREMM multipurpose frigate

 **Morocco**

- Mohammed VI FREMM frigate - 1 x 1
- *Sigma*-class frigate 1x3
- *Descubierta*-class corvette - Spanish built, 1 x 1
- *Floréal*-class frigate 1 x 2
- *Lazaga*-class missile boat 1 x 4
- *Bir Anzaran*-class patrol vessel 1 x 5

 **South Africa**

- *Warrior*-class patrol vessel former fast attack craft modified to OPVs - missiles launchers and rear 76mm gun removed.\*[13]
- *Valour*-class frigate

 **Tunisia**

- *Albatros*-class fast attack craft

**Europe** **Belgium**

- *Karel Doorman*-class frigate

 **Denmark**

- *Flyvefisken*-class patrol vessel
- *Thetis*-class ocean patrol vessel
- *Iver Huitfeldt*-class frigate
- *Knud Rasmussen*-class patrol vessel

 **France**

- FREMM multipurpose frigate
- Horizon-class frigate

 **Germany**

- *Brandenburg*-class frigate - MEKO design
- *Bremen*-class frigate - MEKO design
- *Sachsen*-class frigate - MEKO design
- *Braunschweig*-class corvette - MEKO design
- *Gepard*-class fast attack craft

 **Greece**

- *Elli*-class frigate (*Kortenaer*-class frigate)
- La Combattante IIa-class fast attack craft
- La Combattante III-class fast attack craft
- La Combattante IIIb-class fast attack craft
- Osprey 55-class gunboat
- HSY-55-class gunboat
- Osprey HSY-56A-class gunboat
- *Roussen*-class fast attack craft
- *Jason*-class tank landing ship

 **Ireland**



76mm OTO Melara cannon on the Irish Naval Service patrol vessel LÉ Niamh

- Peacock-class patrol vessel
- Róisín-class offshore patrol vessel
- Samuel Beckett-class offshore patrol vessel

## ■ ■ Italy

- Audace-class destroyer (8 guns, all retired)
- Italian aircraft carrier *Cavour* (2 guns)
- Comandanti class OPV (4 guns)
- Durand de la Penne-class destroyer (6 guns)
- FREMM multipurpose frigate (14 guns)
- Fulmine gunboat (1 gun - the first, prototype -, retired)
- Minerva-class corvette (8 guns, with 4 retired)
- Orizzonte-class frigate (6 guns)
- San Giorgio-class amphibious transport dock (1 gun)
- Sparviero class hydrofoil (7 guns, all retired)

## ■ ■ Netherlands

- Karel Doorman-class frigate
- Holland-class offshore patrol vessel

## ■ ■ Norway

- Fridtjof Nansen-class frigate
- Skjold-class patrol boat

## ■ ■ Poland

- Oliver Hazard Perry-class frigate

## ■ ■ Portugal

- Bartolomeu Dias-class frigate

## ■ ■ Romania

- Regele Ferdinand
- Regina Maria

## ■ ■ Spain

- Santa María-class frigate - 1 x 6
- Descubierta-class corvette - 1 x 6
- Buque de Acción Marítima-class patrol vessel - 1 x 6

## Oceania

## ■ ■ Australia

- Adelaide-class frigate - 1 x 6

## North America

## ■ ■ Canada

- Iroquois-class destroyer after TRUMP modifications - 1 x 4



The Mk75 in use aboard USCGC Gallatin, 2005.



Loading of the 76 mm shells



Underdeck of a Mark 75 gun

### Various aspect of the OTO Melara 76 mm Mark 75 gun in US service

#### United States

- Famous-class cutter (USCG)
- *Hamilton*-class cutter (USCG)
- *Oliver Hazard Perry*-class frigate (USN)
- *Pegasus*-class hydrofoil (now de-commissioned) (USN)

#### Mexico

- *Oaxaca*-class patrol vessel - 1 x 4

#### South America

##### Argentina

- *Espora*-class corvette - license built MEKO 140 design - 1 x 6
- *Intrépida*-class fast attack craft - based on the TNC-45 design - 1 x 2

##### Chile

- *Karel Doorman*-class M-class frigate - 1 x 2
- L-class frigate - 1 x 2
- CNS *Almirante Williams* 1 x 1
- OPV-83 *Marinero Fuentealba*-class Patrulleros de Zona Marítima 1 x 1
- *Sa'ar 4*-class missile boat 2 x 3 (decommissioned)
- *Tiger*-class fast attack craft 1 x 3 (decommissioned)

##### Colombia

- *Almirante Padilla*-class frigate - modernised with Strales 76 mm and DART guided ammunition\* [7] - 1 x 4

#### Ecuador

- Esmeraldas corvettes - 1 x 6
- *Quito*-class missile boat - 1 x 3

#### Peru

- PR-72P-class corvette - 1 x 6

#### Venezuela

- Guaiquerí OPV - 1 x 4
- Guaicamacuto OPV - 1 x 3
- Constitución Class OPV - 2 x 6

### 10.1.5 See also

- 76mm/L62 Allargato

### 10.1.6 References

- [1] “Iran to mass produce new artillery gun” . Middle East Online. 2006-09-27. Retrieved 2012-08-05.
- [2] Annati, Massimo: *La difesa antimissile della MM*, RiD magazine, Chiavari, September 2006
- [3] Po, Enrico, April 1997
- [4] Stanglini, Ruggero: *Dart/DAVIDE, antimissile, ma non solo*, PD Magazine, Ed.ai, Firenze, June 2003
- [5] Annati, Massimo, 2006
- [6] “The Strales 76mm system with DART guided ammunition” . 2014-04-18.
- [7] “Colombia conducts first DART firings” . 2014-09-17. Archived from the original on 17 September 2014.
- [8] Po, Eugenio: *Oto Melara guarda al futuro*, RiD Magazine, July 2009
- [9] “Vulcano 76 mm” . Oto Melara. 2014-09-17. Archived from the original on 18 September 2014.
- [10] Jane's Armour and Artillery, 2001-2002, Volume 23 p. 244-345.
- [11] German built MEKO A-200 AN Frigate for Algerian Navy launched by TKMS in Kiel
- [12] DCNS contracts Oto Melara to supply 76/62 SRMF guns for Egypt's Gowinds - IHS Jane's 360
- [13] “NS Durban to be OPVs home port” . DefenceWeb. Retrieved 2013-10-23.

### 10.1.7 External links

- Official website of Oto Melara 76mm gun
- Officially released video of Oto Melara 76mm during test firing on YouTube
- Italian 76 mm/62 (3") Compact, SR and USA 76 mm/62 (3") Mark 75 at NavWeaps

## 10.2 Phalanx CIWS

The **Phalanx CIWS** is a close-in weapon system for defense against anti-ship missiles. It was designed and manufactured by the **General Dynamics Corporation, Pomona Division**\*[4] (now a part of **Raytheon**). Consisting of a radar-guided 20 mm Gatling gun mounted on a swiveling base, the Phalanx has been used by multiple navies around the world, notably the **United States Navy** on every class of surface combat ship, by the British Royal Navy in its older escorts (where weight limits the use of the heavier Dutch Goalkeepers 30 mm CIWS), by the **United States Coast Guard** aboard its *Hamilton*-class and *Legend*-class cutters, and the navies of 16 allied nations.

A land based variant, known as **C-RAM**, has recently been deployed in a short range missile defense role, to counter incoming rockets and artillery fire.\*[6]

Because of their distinctive barrel-shaped radome and their automated nature of operation, Phalanx CIWS units are sometimes nicknamed "R2-D2" after the famous droid character from the *Star Wars* films.\*[7]\*[8]

### 10.2.1 History

The Phalanx Close-In Weapons System (CIWS) was developed as the last line of automated weapons defense (terminal defense or point defense) against anti-ship missiles (AShMs or ASMs) and attacking aircraft, including high-g and maneuvering sea-skimmers. The first prototype system was offered to the U.S. Navy for evaluation on the **USS King** in 1973 and it was determined that additional improvements were required to improve performance and reliability. Subsequently, the Phalanx Operational Suitability Model successfully completed its Operational Test and Evaluation (OT&E) on board the **USS Bigelow** in 1977. The model exceeded operational maintenance, reliability, and availability specifications. Another evaluation successfully followed, and the weapon system was approved for production in 1978. Phalanx production started with orders for 23 USN and 14 foreign military systems. The first ship fully fitted out was the aircraft carrier **USS Coral Sea** in 1980. The Navy began placing CIWS systems on non-combatant vessels in 1984.

### 10.2.2 Design

The basis of the system is the 20 mm M61 Vulcan Gatling gun autocannon, used since 1959 by the United States military on various tactical aircraft, linked to a Ku-band radar system for acquiring and tracking targets. This proven system was combined with a purpose-made mounting, capable of fast elevation and traverse speeds, to track incoming targets. An entirely self-contained unit, the mounting houses the gun, an automated fire-control system and all other major components, enabling it to automatically search for, detect, track, engage, and confirm kills using its computer-controlled radar system. Due to this self-contained nature, Phalanx is ideal for support ships, which lack integrated targeting systems and generally have limited sensors. The entire unit has a mass between 12,400 and 13,500 lb (5,500 to 6,100 kg).

### Upgrades



*Rounds from a Mk-15 Phalanx CIWS from the guided-missile destroyer USS Mitscher (DDG 57) impact the ex-USNS Saturn (T-AFS-10) during a sinking exercise (SINKEX), 2010.*

Due to the continuing evolution of both threats and computer technology, the Phalanx system has, like most military systems, been developed through a number of different configurations. The basic (original) style is the Block 0, equipped with first-generation, solid-state electronics and with marginal capability against surface targets. The Block 1 (1988) upgrade offered various improvements in radar, ammunition, computing power, rate of fire, and an increase in maximum engagement elevation to +70 degrees. These improvements were intended to increase the system's capability against emerging Russian supersonic anti-ship missiles. Block 1A introduced a new computer system to counter more maneuverable targets. The Block 1B PSuM (Phalanx Surface Mode, 1999) adds a forward-looking infrared (FLIR) sensor to allow the weapon to be used against surface targets.\*[9] This addition was developed to provide ship defense against small vessel threats and other "floaters" in littoral waters and to improve the weapon's performance against slower low-flying aircraft. The FLIR's capability is also of use against low-observability missiles and can be linked with the RIM-

116 Rolling Airframe Missile (RAM) system to increase RAM engagement range and accuracy. The Block 1B also allows for an operator to visually identify and target threats.\*[9]

As the system model manager, the U.S. Navy is in the process of upgrading all their Phalanx systems to the Block 1B configuration. All Phalanx systems in use by the U.S. Navy are scheduled to be upgraded to Block 1B by the end of FY 2015. In addition to the FLIR sensor, the Block 1B incorporates an automatic acquisition video tracker, optimized gun barrels (OGB), and Enhanced Lethality Cartridges (ELC) for additional capabilities against asymmetric threats such as small maneuvering surface craft, slow-flying fixed and rotary-winged aircraft, and unmanned aerial vehicles. The FLIR sensor improves performance against anti-ship cruise missiles, while the OGB and ELC provide tighter dispersion and increased “first-hit” range; the Mk 244 ELC is specifically designed to penetrate anti-ship missiles with a 44-percent-heavier tungsten penetrator round and an aluminum nose piece. Another system upgrade is the Phalanx 1B Baseline 2 radar to improve detection performance, increase reliability, and reduce maintenance. It also has a surface mode to track, detect, and destroy threats closer to the water's surface, increasing the ability to defend against fast-attack boats and low-flying missiles; the Baseline 2 radar upgrade is to be installed on all U.S. Navy Phalanx system-equipped vessels by FY 2019.\*[10] The Block 1B is also used by other navies, such as Canada, Portugal, Japan, Egypt, Bahrain, and the UK.\*[11]

In May 2009, the US Navy awarded a \$260 million contract to Raytheon Missile Systems to perform upgrades and other work on the Phalanx.\*[12]

### Comparison with other CIWS

#### 10.2.3 Operation

The CIWS is designed to be the last line of defense against anti-ship missiles. Due to its design criteria, its effective range is very short relative to the range of modern ASMs, from 1 to 5 nautical miles (9 km). The gun mount moves at a very high speed and with great precision. The system takes minimal inputs from the ship, making it capable of functioning, despite potential damage to the ship. The only inputs required for operation are 440 V AC Three-phase electric power at 60 Hz and water (for electronics cooling). For full operation, including some non-essential functions, it also has inputs for true compass ship's heading and 115 V AC for the PASS subsystem.

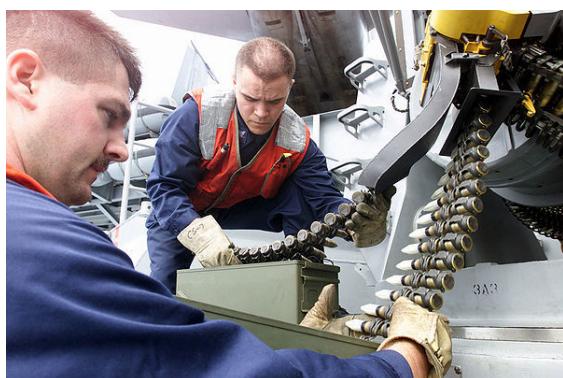
#### Radar subsystems

The CIWS has two antennas that work together to engage targets. The first antenna, for searching, is located in-



*A technician checks the radar transmitter and microwave assemblies of a Phalanx CIWS, most likely a Block 0. On the unit in the background, the search radar can be seen at the top left with the vertical, orange-peel shaped, tracking radar below it.*

side the radome on the weapon control group (top of the white-painted portion). The search subsystem provides bearing, range, velocity, heading, and altitude information of potential targets to the CIWS computer. This information is analyzed to determine whether the detected object should be engaged by the CIWS system. Once the computer identifies a valid target (see details below), the mount moves to face the target and then hands the target over to the tracking antenna. The track antenna is extremely precise, but views a much smaller area. The tracking subsystem observes the target until the computer determines that the probability of a successful hit is maximized and then, depending on the operator conditions, the system will either fire automatically or will recommend fire to the operator. While firing, the system tracks outgoing rounds and 'walks' them onto the target.



*U.S. Navy sailors load tungsten ammunition (white sabots at right) and off-load dummy ammunition (left).*

#### Gun and ammunition handling system

The Block 0 CIWS mounts (hydraulic driven) fired at a rate of 3,000 rounds per minute and held 989 rounds in the magazine drum.\*[4] The Block 1 CIWS mounts (hydraulic) also fired at 3,000 rounds per minute with an extended magazine drum holding 1,550 rounds. The Block

1A and newer (pneumatic driven) CIWS mounts fire at a rate of 4,500 rounds per minute with a 1,550-round magazine. The velocity of the rounds fired is approximately 3,600 feet per second (1,100 m/s). The rounds are armor-piercing tungsten penetrator rounds or depleted uranium with discarding sabots. The Phalanx CIWS 20 mm rounds are designed to destroy a missile's airframe and make it unaerodynamic, thus keeping shrapnel from the exploding projectile to a minimum, effectively keeping collateral damage to a minimum. The ammunition handling system has two conveyor belt systems. The first takes the rounds out of the magazine drum to the gun; the second takes empty shells or non-fired rounds to the opposite end of the drum.

### CIWS contact target identification

The CIWS does not recognize identification friend or foe, also known as IFF. The CIWS only has the data it collects in real time from the radars to decide if the target is a threat and to engage it. A contact has to meet multiple criteria for it to be considered a target. Some of the criteria are listed below:



A sailor sits at a CIWS Local Control Panel (LCP) during a general quarters drill.

1. Is the range of the target increasing or decreasing in relation to the ship? The CIWS search radar will see contacts that are out-bound and discard them. The CIWS will engage a target only if it is approaching the ship.
2. Is the contact capable of maneuvering to hit the ship? If a contact is not heading directly at the ship, the CIWS looks at its heading in relation to the ship and its velocity. It then decides if the contact can still perform a maneuver to hit the ship.
3. Is the contact traveling between the minimum and maximum velocities? The CIWS has the ability to engage targets that travel in a wide range of speeds; however, it is not an infinitely wide range. The system has a target maximum-velocity limit. If a target exceeds this velocity, the CIWS will not engage it. It

also has a target minimum-velocity limit. Any contact below that velocity will also not be engaged by the CIWS. The operator also has the option to adjust the minimum and maximum limits within the limits of the system.

There are many other subsystems that together ensure proper operation, such as environmental control, transmitter, mount movement control, power control and distribution, and so on. It takes six to eight months to train a technician to maintain, operate, and repair the CIWS.

### 10.2.4 Incidents

#### Drone exercise catastrophic accidents

On 10 February 1983, the *USS Antrim* was conducting a live-fire exercise off the East Coast of the United States using the Phalanx against a target drone. Although the drone was successfully engaged at close range, the target debris bounced off the sea surface and struck the ship. This caused significant damage and fire from the drone's residual fuel, which also killed a civilian instructor aboard this ship.\*[16]\*[17]

On 11 October 1989, the *USS El Paso* was conducting a live-fire exercise off the East Coast of the United States using the Phalanx against a target drone. The drone was successfully engaged, but as the drone fell to the sea, the CIWS re-engaged it as a continued threat to the *El Paso*. Rounds from the Phalanx struck the bridge of the *USS Iwo Jima*, killing one officer and injuring a petty officer.\*[18]

#### Iraqi missile attack in 1991 Gulf War

On 25 February 1991, during the first Gulf War, the Phalanx-equipped frigate *USS Jarrett* was a few miles from the US battleship *USS Missouri* and the British destroyer *HMS Gloucester*. The ships were attacked by an Iraqi Silkworm missile (often referred to as the *Seersucker*), at which time the *Missouri* fired its SRBOC chaff. The Phalanx system on *Jarrett*, operating in the automatic target-acquisition mode, fixed on *Missouri*'s chaff, releasing a burst of rounds. From this burst, four rounds hit *Missouri* which was two to three miles (about 5 km) from *Jarrett* at the time. There were no injuries.\*[19] A Sea Dart missile was then launched from *Gloucester* in a 'tail end' engagement; destroying the Iraqi missile as it passed between *Gloucester* and *Missouri*, achieving the first successful engagement of a missile by a missile during combat at sea.



JMSDF mounted Phalanx CIWS

### Accidental downing of US aircraft by the Japanese destroyer *Yūgiri*

On 4 June 1996, a Japanese Phalanx accidentally shot down a US A-6 Intruder from the USS *Independence* that was towing a radar target during gunnery exercises about 1,500 miles west of the main Hawaiian island of Oahu. A Phalanx aboard the Asagiri class destroyer *Yūgiri* locked onto the Intruder instead of the target. Both pilots ejected safely.\*[20] A post-accident investigation concluded that the *Yūgiri*'s gunnery officer gave the order to fire before the A-6 was out of the CIWS engagement envelope.\*[21]\*[22]

### 10.2.5 21st century

#### Centurion C-RAM



Centurion C-RAM

Seeking a solution to constant rocket and mortar attacks on bases in Iraq, the United States Army requested a quick-to-field anti-projectile system in May 2004, as part of its Counter-Rocket, Artillery, Mortar initiative.\*[23] The end result of this program was 'Centurion'. For all intents and purposes, a terrestrial version of the Navy's CIWS, the Centurion was rapidly developed,\*[24] with a proof-of-concept test in November that same year. It began deployment to Iraq in 2005,\*[23]\*[25] where it was

set up to protect forward operating bases and other high-value sites in and around the capital, Baghdad.\*[26] Israel has purchased a single system for testing purposes, and was reported\*<sup>[27]</sup> to have considered buying the system to counter rocket attacks and defend point military installations. However, the swift and effective development and performance of Israel's indigenous Iron dome system has ruled out any purchase or deployment of Centurion.

Each system consists of a modified Phalanx 1B CIWS, powered by an attached generator and mounted on a trailer for mobility. Armed with a 20 mm M61A1 Gatling gun, the unit is capable of firing 4,500 20 mm rounds per minute.\*[6]\*[28] In 2008, there were more than 20 CIWS systems protecting bases in the U.S. Central Command area of operations. A Raytheon spokesman told *Navy Times* that 105 attacks were defeated by the systems, most of those involved mortars. Based on the success of Centurion, 23 additional systems were ordered in September 2008.\*[29]

Like the naval (1B) version, Centurion uses Ku-band radar and FLIR\*<sup>[30]</sup> to detect and track incoming projectiles, and is also capable of engaging surface targets, with the system able to reach a minus-25-degree elevation.\*<sup>[30]</sup> The Centurion is reportedly capable of defending a 0.5 mi square area.\*<sup>[31]</sup> One major difference between the land- and sea-based variants is the choice of ammunition. Whereas naval Phalanx systems fire tungsten armor-piercing rounds, the C-RAM uses the 20 mm HEIT-SD (High-Explosive Incendiary Tracer, Self-Destruct) ammunition, originally developed for the M163 Vulcan Air Defense System.\*<sup>[24]</sup>\*<sup>[32]</sup> These rounds explode on impact with the target, or on tracer burnout, thereby greatly reducing the risk of collateral damage should any rounds fail to hit their target.\*<sup>[24]</sup><ref name="aviationweek.com"/>

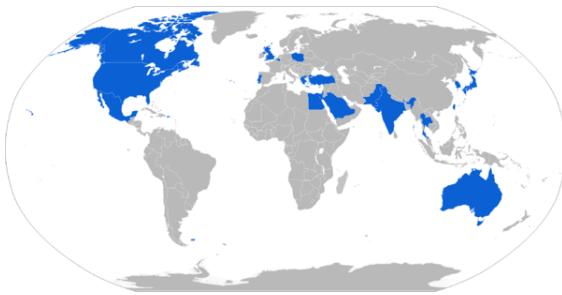
#### SeaRAM

Utilizing the armament of the RIM-116 Rolling Airframe Missile, and based on the mounting and targeting systems of the Phalanx, SeaRAM was developed in response to concerns about the performance of gun-based systems against modern, supersonic, sea-skimming, anti-ship missiles. Designed as a companion self-defense system to Phalanx,\*<sup>[33]</sup> the SeaRAM is equipped with an 11-cell RAM launcher, and provides defense at a longer range. Due to the common mounting, SeaRAM inherits the relatively easy installation characteristics of its gun-based sibling, with Raytheon stating that "[SeaRAM] fits the exact shipboard installation footprint of the Phalanx, uses the same power and requires minimal shipboard modification."\*<sup>[33]</sup> Currently in the trial stages, SeaRAM is fitted to the Independence Class Littoral Combat Ship.\*<sup>[33]</sup>



SeaRAM

### 10.2.6 Operators



Map of Phalanx CIWS operators in blue

#### Current operators

### 10.2.7 Specifications (Block 1A/B)

- **Gun:** 1× 20 mm M61 Vulcan 6-barreled Gatling cannon\* [4]
- **Height:** 15.5 ft (4.7 m)
- **Weight:** 12,500 lb (5,700 kg), later models 13,600 lb (6,200 kg)\* [1]
- **Elevation** –25° to +85°
- **Muzzle velocity:** 3,600 ft/s (1,100 m/s)
- **Rate of fire:** 4,500 rounds/minute
- **Maximum burst size:** 1000 rounds
- **Ammunition capacity:** 1,550 rounds



*Raytheon Missle Systems Phalanx Block 1B close-in weapon system (CIWS) on board the Royal Navy Type 45 destroyer HMS Daring.*

- **Radar:** Ku band
- **100% Kill distance:** Classified
- **Cost:** \$3.8 Million \* [41]

### 10.2.8 Similar systems

- AK-630, Russian CIWS
- Kashtan CIWS, Russian Gun-Missile CIWS
- Goalkeeper CIWS, Dutch CIWS
- Meroka CIWS, Spanish navy
- Barak 1, Israel. missile-based
- RIM-116 Rolling Airframe Missile, U.S. missile-based
- Type 730 CIWS, Chinese CIWS

### 10.2.9 References

#### Notes

- [1] "The US Navy – Fact File" . Navy.mil. 2009-11-09. Retrieved 2010-04-13.
- [2] Tony DiGiulian (2010-06-16). "USA 20 mm Phalanx Close-in Weapon System (CIWS)". NavWeaps.com. Retrieved 2010-10-26.
- [3] John Pike (2005-04-27). "MK 15 Phalanx Close-In Weapons System (CIWS)". Globalsecurity.org. Retrieved 2010-04-13.
- [4] Thomas, Vincent C. *The Almanac of Seapower 1987* Navy League of the United States (1987) ISBN 0-9610724-8-2 p.191
- [5] Archived October 7, 2009 at the Wayback Machine
- [6] "Murdoc online March 20, 2006 CIWS now does surface targets, too" . Murdoconline.net. Retrieved 2010-04-13.
- [7] "Spacewar.com" . Spacewar.com. Retrieved 2010-04-13.
- [8] "TELUS, news, headlines, stories, breaking, canada, canadian, national" . Home.mytelus.com. Retrieved 2010-04-13.
- [9] "Raytheon Company: Phalanx" . Raytheon.com. Retrieved 2010-04-13.
- [10] Navy Overhauls Phalanx Ship Defense Weapon - Defensetech.org, 21 August 2013
- [11] "Raytheon Awarded Phalanx 1B Upgrade Order for Royal Navy" . Prnewswire.com. Retrieved 2010-04-13.
- [12] *Arizona Daily Star*, May 16, 2009. "Navy Awards \$260 Million In Additional Work On Ship Weapons System To Raytheon"
- [13] "AK-630 Gatling Gun Close in Weapon System". Indian-military.org. 2010-03-12. Retrieved 2012-08-04.
- [14] Dan Petty. "The US Navy – Fact File:". Navy.mil. Retrieved 2012-08-04.
- [15] Tony DiGiulian. "Italy 40 mm/70 (1.57" ) Breda" . Navweaps.com. Retrieved 2012-08-04.
- [16] "USS Antrim (FFG 20)". Navysite.de. Retrieved 2012-08-04.
- [17] "USS Antrim FFG-20" . Historycentral.com. Retrieved 2012-08-04.
- [18] Plunkett, A.J. (October 12, 1989). "Iwo Jima Officer Killed In Firing Exercise" . Daily Press. Retrieved 2013-08-16.
- [19] "Tab-H Friendly-fire Incidents" . Gulflink.osd.mil. Retrieved 2010-04-13.
- [20] Cable News Network. Japan apologizes for gunning down U.S. plane. June 4, 1996.
- [21] The Virginian-Pilot. Human Error Cited In Downing Of Navy Plane By Japanese. October 24, 1996.
- [22] Transcript of the DoD investigation of the incident
- [23] "Army C-RAM Intercepts 100th Mortar Bomb in Iraq" . Defense-update.com. 2007-06-07. Retrieved 2010-04-13.
- [24] "Navy News, news from Iraq" . Navy Times. 2005-06-27. Retrieved 2010-04-13.
- [25] "First C-RAM joint intercept battery organizes for combat. – Free Online Library" . Thefreelibrary.com. Retrieved 2010-04-13.
- [26] [http://www.timripley.co.uk/articles/jdw\\_uk\\_deploys\\_c\\_ram.pdf](http://www.timripley.co.uk/articles/jdw_uk_deploys_c_ram.pdf)
- [27] "BMD Focus: Barak dithered on Phalanx" . Space-war.com. Retrieved 2010-04-13.
- [28] "Israel may buy rapid-fire cannon" Jerusalem Post Dec 20, 2007
- [29] Analyst: DDGs without CIWS vulnerable. *Navy Times*. September 16, 2008
- [30]
- [31] 23-Apr-2009 13:20 EDT (2009-04-23). "A Laser Phalanx?". Defenseindustrydaily.com. Retrieved 2010-04-13.
- [32] "Counter-RAM Systems Target Rockets" . Aviation Week. 2009-08-27. Retrieved 2010-04-13.
- [33] Raytheon. SeaRAM datasheet. (PDF)
- [34] "Mk 15 Phalanx Block 0 / CIWS, Close-In Weapon System" . Deagel.com. 2010-03-07. Retrieved 2010-04-13.
- [35] "World Navies Today: india" . Hazegray.org. 2002-03-24. Retrieved 2010-04-13.
- [36] "Mk 15 Phalanx Block 1B / CIWS, Close-In Weapon System" . Deagel.com. Retrieved 2010-04-13.
- [37] "INS Jalashwa" . bharat-rakshak.com. Retrieved 2015-04-16.
- [38] "Mexico Missile Boats" . HAARETZ.com. 2003-12-23. Retrieved 2013-04-10.
- [39] "Raytheon to deliver 9 Phalanx CIWS to Republic of Korea Navy" . February 25, 2014.
- [40] "World Navies Today: Thailand" . Hazegray.org. 2002-03-25. Retrieved 2010-04-13.
- [41] "FY97 Annual Report - PHALANX CLOSE-IN WEAPON SYSTEM (CIWS)" . Globalsecurity.org. Retrieved 2016-01-05.

### 10.2.10 External links

- Official United States Navy Warfighters Encyclopedia CIWS page
- GlobalSecurity.org fact file
- Raytheon Company Phalanx CIWS product page

## 10.3 Mark 32 Surface Vessel Torpedo Tubes



A Mark 46 torpedo launching from the Mark 32 Surface Vessel Torpedo Tubes set aboard USS Mustin



Personnel from USS Porter loading a recoverable training torpedo into the top tube of a Mark 32 launcher

The **Mark 32 Surface Vessel Torpedo Tubes** (Mk 32 SVTT) system<sup>\*[1]</sup> is a torpedo launching system designed for the United States Navy. The Mark 32 has been the standard anti-submarine torpedo launching system aboard United States Navy surface vessels since its introduction<sup>\*[2]</sup> in 1960, and is in use aboard the warships of several other navies.<sup>\*[2]</sup>

Most versions (referred to as modifications or mods) are triple-tube sets that can be rotated or trained to face a target.<sup>\*[2]</sup> The exception is the Mod 9 sets, which only have two tubes and are fixed in position.<sup>\*[2]</sup> The Mark 32 can fire torpedoes of the **Mark 44**, **Mark 46**, **Mark 50** (from the Mod 17 tubes onwards),<sup>\*[2]</sup> and **Mark 54** designs, and can be modified to use other torpedoes (such as the MU90 Impact aboard Royal Australian Navy frigates, or Royal Navy units using **Sting Ray** torpedoes).<sup>\*[3]\*[4]</sup> The tubes are designed to be fired remotely, but manual firing controls are fitted as a backup to all but the **Spruance**-class destroyer's Mod 15 sets, as all aspects of the tubes' operation are controlled remotely.<sup>\*[2]</sup> The launch is powered by compressed air<sup>\*[2]</sup> in a rear flask, which also doubles as each tube's breech, and the torpedoes are fire-and-

forget weapons.

The launcher can be made from fibreglass, or with a fibre-glass liner encased in metal.<sup>\*[2]</sup> The tubes were designed to be weatherproof and capable of storing torpedoes for long periods, but this is only practical with regular maintenance. Each triple-tube set weighs around 2,230 pounds (1,010 kg) unloaded, with variations between mods.<sup>\*[2]</sup>

### 10.3.1 See also

- List of naval weapon systems

### 10.3.2 References

- [1] Jane's: SVTT Mk 32 (United States), Weapon handling and launching systems
- [2] Friedman, Norman (2006). *The Naval Institute Guide to World Naval Weapon Systems* (5th ed.). Annapolis, MD: Naval Institute Press. pp. 754–5.
- [3] Fish, Tim; Grevatt, Jon (24 June 2008). “Australia’s HMAS Toowoomba test fires MU90 torpedo”. *Jane’s Navy International* (Jane’s Information Group).
- [4] Chant, Chris (2005). *Submarine Warfare Today: The World’s Deadliest Underwater Systems*. Leicester: Silverdale Books. p. 143. ISBN 1-84509-158-2.

## 10.4 Mark 46 torpedo

Mk 46 is also the designation of the **Mk 46 Mod 0** variant of the **M249 light machine gun**

The **Mark 46 torpedo** is the backbone of the United



A Mark 46 Mod 5A torpedo is inspected aboard the guided missile destroyer USS Mustin

States Navy's lightweight anti-submarine warfare torpedo



*A French Lynx helicopter carrying a Mk 46 torpedo*

inventory, and is the current **NATO** standard. These aerial torpedoes are designed to attack high-performance submarines, and current variants, such as the Mark 46 Mod 5, are expected to remain in service until the year 2015. In 1989, a major upgrade program for the Mod 5 began to improve its shallow-water performance, resulting in the Mod 5A and Mod 5A(S).

#### 10.4.1 Design details

##### Mark 46, Mod 5

- Primary Function: Air and ship-launched lightweight torpedo<sup>\*[3]</sup>
- Contractor: Alliant Techsystems
- Power Plant: Two-speed, reciprocating external combustion; Mono-propellant (Otto fuel II)
- Length: 8 ft 6 in (2.59 m) tube launch configuration (from ship),<sup>\*[4]</sup> 14 ft 9 in (4.5 m) with ASROC rocket booster<sup>\*[3]</sup>
- Weight: 508 lb (231 kg)<sup>\*[3]</sup> (warshot configuration)
- Diameter: 12.75 in (324 mm)<sup>\*[4]</sup>
- Range: 12,000 yd (11 km)<sup>\*[3]</sup>
- Depth: > 1,200 ft (365 m)
- Speed: > 40 knots (46 mph, 74 km/h)<sup>\*[3]</sup>
- Guidance System: Homing mode: Active or passive/active acoustic homing<sup>\*[4]</sup>
- Launch/search mode: Snake or circle search
- Warhead: 96.8 lb (44 kg)<sup>\*[3]</sup> of PBXN-103 high explosive (bulk charge)
- Date Deployed: 1967 (Mod 0);<sup>\*[3]</sup> 1979 (Mod 5)

#### 10.4.2 Yu-7 variant

The Chinese Yu-7 torpedo is said to be based on the Mk 46 Mod 2.<sup>\*[5]</sup> Currently, the **Chinese Navy** use the Yu-7 ASW torpedo, deployed primarily on ships and ASW helicopters.<sup>\*[6]</sup>

#### 10.4.3 Operators



*Map with former Mark 46 operators in red*

- Australia
- Bahrain
- Belgium
- Brazil
- Canada
- Chile
- Ecuador
- Egypt
- France
- Germany
- Greece
- Indonesia
- Iran
- Israel
- Italy
- Japan
- Kuwait
- Mexico
- Morocco
- Netherlands
- New Zealand

- Norway
- Pakistan
- Peru
- Portugal
- Saudi Arabia
- South Korea
- Spain
- Taiwan
- Thailand
- Turkey
- United Arab Emirates
- United Kingdom
- United States<sup>\*[7]</sup>

#### 10.4.4 See also

- CAPTOR mine (a sea mine which incorporates a Mk 46 torpedo)
- MU90 Impact torpedo
- Mark 50 torpedo
- Mark 54 MAKO Lightweight Torpedo
- Stingray torpedo

#### 10.4.5 References

##### Citations

- [1] Jolie, E.W. (15 September 1978). “A Brief History of US Navy Torpedo Development: Torpedo Mk46”. Retrieved 24 June 2013.
- [2] “The US Navy Fact File: Mark 46 Torpedo”. 27 November 2012. Retrieved 24 June 2013.
- [3] Thomas, Vincent C. *The Almanac of Seapower 1987* Navy League of the United States (1987) ISBN 0-9610724-8-2 pp.190-191
- [4] Polmar, Norman “The Ships and Aircraft of the U.S. Fleet: Torpedoes” *United States Naval Institute Proceedings* November 1978 p.160
- [5] Chinese Defence Today, “YU-7 Anti-Submarine Torpedo”
- [6] (Chinese language)
- [7] Weapon - Mk. 46 torpedo

#### 10.4.6 External links

- DiGiulian, Tony, Navweaps.com: USA Torpedoes
- Unofficial U.S. Navy Site: MK-46 Torpedo
- FAS: MK-46 Torpedo

### 10.5 Mark 50 torpedo

The **Mark 50 torpedo** is a U.S. Navy advanced lightweight torpedo for use against fast, deep-diving submarines. The Mk 50 can be launched from all anti-submarine aircraft and from torpedo tubes aboard surface combatant ships. The Mk 50 was intended to replace the **Mk 46** as the fleet's lightweight torpedo.<sup>\*[1]</sup> Instead the Mark 46 will be replaced with the **Mark 54 LHT**.

The torpedo's stored chemical energy propulsion system uses a small tank of **sulfur hexafluoride gas**, which is sprayed over a block of **solid lithium**, which generates enormous quantities of **heat**, which generates steam. The steam propels the torpedo in a closed **Rankine cycle**,<sup>\*[5]</sup> supplying power to a **pump-jet**. This propulsion system offers the very important deep-water performance advantage in that the combustion products—sulfur and lithium fluoride—occupy less volume than the reactants, so the torpedo does not have to force these out against increasing water pressure as it approaches a deep-diving submarine.

#### 10.5.1 General characteristics, Mk 50



*Mark 50 propulsor.*

- Primary function: air and ship-launched lightweight torpedo<sup>\*[1]\*[3]</sup>
- Contractor: Alliant Techsystems, Westinghouse<sup>\*[3]</sup>

- Length: 9.5 ft (2.9 m)<sup>\*[3]</sup>
- Weight: approx. 800 lb (360 kg)<sup>\*[3]</sup>
- Diameter: 12.75 in (0.324 m)<sup>\*[3]</sup>
- Speed: > 40 kn (46 mph)<sup>\*[3]</sup>
  
- Power Plant: Stored Chemical Energy Propulsion System<sup>\*[1]</sup>
- Propulsion: Pump Jet
- Guidance system: Active/passive acoustic homing<sup>\*[1]\*[3]</sup>
- Warhead: 100 lb (45 kg) high explosive<sup>\*[1]\*[3]</sup>

### 10.5.2 Comparable Weapons

- Stingray torpedo
- MU90 Impact

### 10.5.3 Notes

- [1] Thomas, Vincent C. *The Almanac of Seapower 1987* Navy League of the United States (1987) ISBN 0-9610724-8-2 p.190
- [2] “Mark 50” . Deagel.com. Deagel.com, 2012. Accessed 5 Dec 2012.
- [3] “U.S. Navy Fact File: Mk-50 Torpedo” . *The U.S. Navy-Fact File*. Department of the Navy, 27 Nov 2012. Accessed 4 Dec 2012.
- [4] “Ticonderoga Class Aegis Guided Missile Cruisers, United States of America.” Naval-technology.com. Net Resources International, 2012. Accessed 5 Dec 2012.
- [5] Hughes, T.G.; Smith, R.B. and Kiely, D.H. (1983). “Stored Chemical Energy Propulsion System for Underwater Applications” . *Journal of Energy* 7 (2): 128–133. doi:10.2514/3.62644.

### 10.5.4 References

- MK-50 Advanced Lightweight Torpedo via FAS
- USA Torpedoes since World War II - navweaps.com
- Issues Related to the Navy's Mark-50 Torpedo Propulsion System, General Accounting Office, January 1989 - has diagrams showing internal general arrangement, retrieved December 18, 2012

## 10.6 Mark 13 missile launcher

The **Mark 13 guided missile launching system (GMLS)** is a single-arm missile launcher designed for use on frigates and other military vessels. Because of its distinctive single-armed design, the Mark 13 is often referred to as the “one-armed bandit.”

The Mark 13 is equipped to fire the RIM-66 Standard, RGM-84 Harpoon, and RIM-24 Tartar missiles for anti-air and anti-ship defense, and is capable of firing the Standard at a rate of one every eight seconds.<sup>\*[2]</sup> Its 40-round magazine consists of two concentric rings of vertically stored missiles, 24 in the outer ring and 16 in the inner. Total capacity was reduced by 1 due to a requirement to carry a Guided Missile Training Round (GMTR) in order to test system functionality. In case of a fire, the system is equipped with magazine sprinkling, CO<sub>2</sub> suppression and booster suppression. It is also equipped with a dud jettison function to eject a round overboard if it fails to fire.<sup>\*[1]</sup>

### 10.6.1 Usage

In the United States Navy, the Mark 13 launcher was most typically employed as part of the **Mark 74 Guided Missile Launch System**, or the **Mark 92 Fire Control System**. Though the launcher was original armament on U.S. Navy **Perry-class** frigates (and their derivatives), in order to save costs on an obsolete system, by 2004 all active U.S. Navy vessels have had the system removed.<sup>\*[3]</sup> It was also fitted on the French **Cassard-class** frigates, as well as the two **Mitscher-class** destroyers converted to DDGs, the last ten American Charles F. Adams-class destroyers, the American California-class cruisers, the German Lütjens-class destroyers and Australian Perth-class destroyers, **Adelaide-class** frigates, Netherlands Tromp-class frigates and Jacob van Heemskerck-class frigates, and Italian Durand de la Penne-class destroyer.

### 10.6.2 Variations

The **Mark 22 guided missile launching system (GMLS)** is a variation of the Mark 13 launcher which has only the inner 16 round storage ring of the Mark 13 launcher.<sup>\*[2]</sup> It was deployed on US-designed, **Baleares-class** Spanish frigates.<sup>\*[4]</sup> and US Navy **Brooke class** frigates. Another major difference is that on the Mark 22 the magazine is non-rotating. The launcher rotates over the desired missile and it is then hoisted onto the rail. On the Mark 13 the magazine rotates under the launcher.<sup>\*[5]</sup>

### 10.6.3 Gallery

- A Standard MR missile being fired from the Mark 13 launcher of Spanish frigate *Canarias*

- A Harpoon Missile on the rail of a Mark 13 aboard *USS Goldsborough*
- Training round (GMTR) loaded for testing aboard *HMAS Adelaide*
- Elevated viewpoint of the Mark 13 launcher aboard *USS Doyle*
- Diagram of the Mark 13 mod 4 GMLS

#### 10.6.4 References

- [1] NAVEDTRA 14909 Gunner's Mate 3 & 2 – Chapters 7 through 8 (1996) via alternatewars.com Accessed May 11, 2014
- [2] United Defense (March 29, 1998). "mk13-gmls.pdf" (PDF). Federation of American Scientists Military Analysis Network. Retrieved April 15, 2007.
- [3] Burgess, Richard R. (September 2003). "Guided Missiles Removed from Perry-class Frigates (Sea Services section: Northrop Grumman-Built DDG Mustin Commissioned in U.S. Pacific Fleet)". *Sea Power* (Washington, D.C.: Navy League of the United States) 46 (9): 34. ISSN 0199-1337. OCLC 3324011. Retrieved 2008-09-22. (dead link)
- [4] Friedman, Norman, The Naval Institute Guide to World Naval Weapons Systems 1997-1998, Page 419, USNI Press © 1997.
- [5] Gunner's Mate 3 & 2 Chapter 5. USN. Accessed May 12, 2014.

#### 10.6.5 See also

- List of United States Navy Guided Missile Launching Systems
- Tartar Guided Missile Fire Control System
- M-11 Shtorm Russian counterpart

#### 10.6.6 External links

- NAVEDTRA 14909 Gunner's Mate 3 & 2 – Chapters 7 through 8 (1996) via alternatewars.com
- FAS Mk 13 GMLS

### 10.7 RIM-66 Standard

See also: Standard Missile

The **RIM-66 Standard MR** (SM-1MR/SM-2MR) is a medium range surface-to-air missile (SAM) originally developed for the United States Navy (USN). The SM-1 was developed as a replacement for the RIM-2 Terrier and RIM-24 Tartar that were deployed in the 1950s

on a variety of USN ships. The **RIM-67 Standard** (SM-1ER/SM-2ER), is an extended range version of this missile with a solid rocket booster stage.

#### 10.7.1 Description

The Standard missile program was started in 1963 to produce a family of missiles to replace existing guided missiles used by the Terrier, Talos, and Tartar guided missile launch systems. The intention was to produce a new generation of guided missiles that could be retrofit to existing guided missile systems.\* [3]

#### Standard missile 1

The RIM-66A is the medium ranged version of the Standard missile and was initially developed as a replacement for the earlier RIM-24C as part of the **Mk74 "Tartar"** Guided Missile Fire Control System. It used the same fuselage as the earlier Tartar missile, for easier use with existing launchers and magazines for that system. The RIM-66A/B while looking like the earlier RIM-24C on the exterior is a different missile internally with redesigned electronics and a more reliable homing system and fuse that make it more capable than its predecessor. The RIM-66A/B Standard MR, (SM-1MR Block I to V) was used during the **Vietnam War**. The only remaining version of the Standard missile 1 in service is the RIM-66E (SM-1MR Block VI). While no longer in service with the **USN**, the RIM-66E is still in service with many navies globally and is expected to remain in service until 2020.

#### Standard missile 2

The RIM-66C/D Standard MR (SM-2MR Block I), was developed in the 1970s and was a key part of the **Aegis combat system** and **New Threat Upgrade** (NTU). The SM-2MR introduced inertial and command mid-course guidance. The missile's autopilot is programmed to fly the most efficient path to the target and can receive course corrections from the ground. Target illumination for semi-active homing is needed only for a few seconds in the terminal phase of the interception. This capability enables the Aegis combat system and New Threat Upgrade equipped vessels to time share illumination radars, greatly increasing the number of targets that can be engaged in quick succession. Mk 41 VLS adopts modular design concept, which result in different versions that vary in size and weight. The length comes in three sizes: 209 in (530 cm) for the self-defense version, 266 in (680 cm) for the tactical version, and 303 in (770 cm) for the strike version. The empty weight for an 8-cell module is 26,800 lb (12,200 kg) for the self-defense version, 29,800 lb (13,500 kg) for the tactical version, and 32,000 lb (15,000 kg) for the strike version.

In the middle 1980s, the SM-2MR was deployed via Mk 41 Vertical Launch System (VLS) aboard *USS Bunker Hill*, the first U.S. Navy ship to deploy a vertical launcher. VLS has, since 2003, been the only launcher used for the Standard missile in the U.S. Navy aboard *Ticonderoga*-class cruisers and *Arleigh Burke*-class destroyers.

The United States Navy is committed to keeping the Standard Missile 2 medium range viable until 2035.\*[4]

The SM-1 and SM-2 were continuously upgraded through Blocks (see below).

The Standard can also be used against ships, either at line-of-sight range using its semi-active homing mode, or over the horizon using inertial guidance and terminal infrared homing.\*[5]

### 10.7.2 Contractors

Standard missiles were constructed by General Dynamics Pomona Division until 1992, when it became part of the Hughes Missile Systems Company. Hughes formed a joint venture with Raytheon called Standard Missile Company (SMCo). Hughes Missile Systems was eventually sold to Raytheon making it the sole contractor.\*[6]

### 10.7.3 Operational history

The Standard missile one became operational in 1968. The missile was utilized by ships equipped with the *Tartar Guided Missile Fire Control System*. The missile saw its first combat use in the early 1970s in the Vietnam war.

The Standard Missile Two became operational in the late 1970s and was deployed operationally with the Aegis Combat System in 1983. Both Standard one and two were used against both surface and air targets during Operation Praying Mantis. On July 3, 1988, *USS Vincennes* mistakenly shot down *Iran Air Flight 655*, an Airbus A300B2, using two SM-2MR missiles from her forward launcher.\*[7] In 1988 the Iranian *Kaman*-class missile boat *Joshan* was disabled by RIM-66 Standard missiles during Operation Praying Mantis.\*[8]

### 10.7.4 Deployment history

The Standard missile is designated by blocks depending upon their technological package.

#### SM-1 Medium Range Block I/II/III/IV, RIM-66A

The First Standard missiles entered service in the USN in 1967. Blocks I, II, and III were preliminary versions. Block IV was the production version. This missile was a replacement for the earlier RIM-24C Tartar missile.



RIM-66M Standard launching

#### SM-1 Medium Range Block V, RIM-66B

The RIM-66B introduced changes that resulted in higher reliability. A new faster reacting autopilot, a more powerful dual thrust rocket motor, and a new warhead were added. Many RIM-66A missiles were re-manufactured into RIM-66B.

#### SM-1 Medium Range Blocks VI/VIA/VIB, RIM-66E

The RIM-66E was the last version of the standard missile one medium range. This version entered service in 1983\* [9] with the United States Navy and export customers. The RIM-66E was used by all remaining *Tartar* vessels that were not modified to use the *New Threat Upgrade* and *Oliver Hazard Perry*-class frigates which controlled it with the Mk92 fire control system. Production of this missile ended in 1987. The missile was retired from USN service in 2003; however there are a large number of this model in service abroad and it is expected to remain viable until 2020.\* [10]

#### SM-2 Medium Range Block I, RIM-66C/D

The RIM-66C was the first version of the Standard missile two. The missile became operational in 1978 with the *Aegis combat system* fitted to the *Ticonderoga*-class cruiser. The RIM-66D was the SM-2 medium range block I version for the *New Threat Upgrade*. The SM-

2 incorporates a new autopilot giving it inertial guidance in all phases of flight except for the terminal intercept where semi-active radar homing is still used. This version is no longer in service; remaining missiles have either been remanufactured into later models or have been put in storage.

### **SM-2 Medium Range Block II, RIM-66G/H/J**

The Block II missile was introduced in 1983 with a new rocket motor for longer range and a new warhead. The RIM-66G is for the Aegis combat system and the Mk26 missile launcher. The RIM-66H is for Aegis and the Mk41 vertical launcher. The RIM-66J is the version for the New Threat Upgrade. Block II missiles are no longer manufactured, and have been withdrawn from service. The remainder have either been put in storage, scrapped for spare parts, or remanufactured into later models.

### **SM-2 Medium Range Block III/IllA/IllB, RIM-66K/L/M**

The RIM-66M is the version of the Standard missile two medium range (SM-2MR) currently in service with the USN aboard *Ticonderoga*-class cruisers and *Arleigh Burke*-class destroyers. The missile is specifically designed for the Aegis Combat System and the **Mk41 Vertical launch system**. The Block III missiles differ from earlier blocks by the addition of the MK 45 MOD 9 target detecting device, for improved performance against low altitude targets. The Block IIIB missile additionally has a dual semi-active/infrared seeker for terminal homing. The dual seeker is intended for use in high-**ECM** environments, against targets over the horizon or with a small radar cross section.\* [10] The seeker was originally developed for the canceled **AIM-7R Sparrow** air-to-air missile. All USN Block III and IIIA missiles are to be upgraded to Block IIIB. Block IIIA missiles are operated by the Japanese Maritime Self-Defense Force on its *Kongō*-class and *Atago*-class Aegis destroyers. Aegis equipped vessels in the Spanish and South Korean navies use it as well. The Dutch and German Navies have added it to the Anti-Air Warfare system, which uses the **Thales Nederland Active Phased Array Radar** and Smart-L radar. South Korean KDX-II destroyers use the block IIIA with a New Threat Upgrade compatible guided missile fire control system. Block III variants for Aegis and arm launchers are designated RIM-66L. Block III missiles for New Threat Upgrade systems are designated RIM-66K. Block IIIB missiles were not produced for the New Threat Upgrade. Blocks IIIA and IIIB are the current production versions. The Thales Nederland STIR 1.8 and 2.4 fire control systems are also supported.\* [2]



A RIM-66 being assembled.

### **Deployment**

In the **US Navy**, RIM-66 Standard was deployed on ships of the following classes, replacing RIM-24 Tartar in some cases:

- *Charles F. Adams*-class destroyer (Mk74 Missile Fire Control)
- *Albany*-class cruiser (Mk74 Missile Fire Control)
- *Oliver Hazard Perry*-class frigate (Mk 92 Missile Fire Control)
- *Kidd*-class destroyer (Mk74 Missile Fire Control SM-1/later New Threat Upgrade for SM-2)
- *California*-class cruiser (Mk74 Missile Fire Control SM-1/later New Threat Upgrade for SM-2)
- *Virginia*-class cruiser (Mk74 Missile Fire Control SM-1/later New Threat Upgrade for SM-2)
- *Ticonderoga*-class cruiser (Aegis Combat System )
- *Arleigh Burke*-class destroyer (Aegis Combat System )

RIM-66 has also been widely exported and is in service in other navies worldwide.

### **10.7.5 Surface to air variants**

Table sources, reference material:<sup>\*</sup>[1]<sup>\*</sup>[9]<sup>\*</sup>[10]<sup>\*</sup>[11]

### **10.7.6 Land Attack Standard Missile**

The RGM-165 LASM, also given the designation SM-4, was intended as means to give long range precision fires in support of the **US Marine Corps**. Intended as an adaptation of the RIM-66, it retained the original MK 125 warhead and MK 104 rocket motor, with the radar seeker replaced by GPS/INS guidance. While test fired

in 1997 using three modified RIM-66K SM-2MR Block III missiles, with 800 missiles set for replacement and IOC expected for 2003/2004, it was cancelled in 2002 due to limited capabilities against mobile or hardened targets.\*[12]\*[13]

### 10.7.7 Operators



Map shows the RIM-66 MR operator as of 2015 (former operators in red)



HNLMS De Zeven Provinciën launching a RIM-66.



A RIM-66 being launched in 2006 from the Spanish frigate Cánarias



German Sachsen-class frigate Sachsen launching a RIM-66.

#### Current operators

##### Australia

- Royal Australian Navy(Onboard *Adelaide*-class frigates & *Hobart*-class destroyers)

##### Canada

- Royal Canadian Navy(Onboard *Iroquois*-class destroyers)

##### Chile

- Chilean Navy (Onboard *Jacob van Heemskerck*-class frigates)

##### Denmark

- Royal Danish Navy (Onboard *Iver Huitfeldt*-class frigates)

##### France

- French Navy (Onboard *Cassard*-class frigates)

##### Egypt

- Egyptian Navy (Onboard *Oliver Hazard Perry*-class frigates)

##### Germany

- German Navy (Onboard *Sachsen*-class air defense frigates)

 **Iran**

- Islamic Republic of Iran Navy (on frigates and a few of Kaman/Sina-class missile boats)

 **Italy**

- Italian Navy (Onboard *Durand de la Penne*-class destroyers)

 **Japan**

- Japan Maritime Self Defense Force (Onboard *Hatakaze*-class, *Kongō*-class & *Atago*-class destroyers)

 **Netherlands**

- Royal Netherlands Navy (Onboard *De Zeven Provinciën*-class frigates)

 **Poland**

- Polish Navy (onboard *Oliver Hazard Perry*-class frigates)

 **South Korea**

- Republic of Korea Navy (onboard *Chungmugong Yi Sun-sin*-class & *Sejong the Great*-class destroyers)

 **Spain**

- Spanish Navy (onboard *Santa María*-class & *Álvaro de Bazán*-class frigates)

 **Taiwan**

- ROC Navy (onboard *Cheng Kung*-class & *Chi Yang*-class frigates, *Kee Lung*-class destroyers)

 **Turkey**

- Turkish Navy (Onboard *G*-class frigates)

 **United States**
**Former operators**
 **Greece**

- Hellenic Navy (onboard *Charles F. Adams*-class destroyers 1991-2004)

### 10.7.8 See also

- Aster\_(missile\_family)
- Aegis combat system
- AGM-78 Standard ARM
- Mk 74 "Tartar" Guided Missile Fire Control System
- Mk 92 Guided Missile Fire Control System
- New Threat Upgrade
- RIM-2 Terrier
- RIM-8 Talos
- RIM-24 Tartar - predecessor
- RIM-67 Standard Extended Range
- RIM-156 Standard SM-2ER Block IV
- RIM-161 Standard SM-3
- RIM-174 Standard SM-6 Extended Range Active Missile

### 10.7.9 References

- [1] United States Navy, US Navy Fact File:Standard Missile, October 11, 2002. Accessed June 5, 2006.
- [2] Raytheon, Raytheon.com, March 17, 2009, Accessed August 24, 2009.
- [3] "Raytheon RIM-66 Standard MR". Retrieved 27 October 2015.
- [4] Raytheon Press Release December 17, 2012. Accessed May 19, 2013.
- [5] Canadian Forces Maritime Command. Standard missile. Accessed June 5, 2006. Archived December 9, 2007 at the Wayback Machine
- [6] GlobalSecurity.org - Standard specs Designation systems RIM-66.
- [7] United States Navy. "Formal Investigation into the Circumstances Surrounding the Downing of Iran Air Flight 655 on 3 July 1988" (PDF). Retrieved 2007-01-28.
- [8] Surface Combatant Weapon System RIM-67 / RIM-156 Standard Missile ER SM-1ER / SM-2ER

- [9] "Raytheon RIM-66 Standard MR". Retrieved 27 October 2015.
- [10] USNI Combat Fleets 2005-2006, Wertheim, Eric; Editor, USN section Naval Institute Press © 2005
- [11] John Pike. "SM-2 RIM-66 / RIM-67 Standard Missile". Retrieved 27 October 2015.
- [12] "Raytheon RGM-165 LASM". Retrieved 27 October 2015.
- [13] John Pike. "RGM-165 Land Attack Standard Missile [LASM]". Retrieved 27 October 2015.

### 10.7.10 External links

- Raytheon Standard missile website, mfr of Standard missiles
- Navy Fact file - Standard Missile 2
- NAVAIR War fighters encyclopedia - Standard missile
- Designation systems.net RIM-66
- FAS - SM-2
- GlobalSecurity.org - SM-2

## 10.8 Harpoon (missile)

The **Harpoon** is an all-weather, over-the-horizon, anti-ship missile system, developed and manufactured by McDonnell Douglas (now Boeing Defense, Space & Security). In 2004, Boeing delivered the 7,000th Harpoon unit since the weapon's introduction in 1977. The missile system has also been further developed into a land-strike weapon, the Standoff Land Attack Missile (SLAM).

The regular Harpoon uses active radar homing, and a low-level, sea-skimming cruise trajectory to improve survivability and lethality. The missile's launch platforms include:

- Fixed-wing aircraft (the **AGM-84**, without the solid-fuel rocket booster)
- Surface ships (the **RGM-84**, fitted with a solid-fuel rocket booster that detaches when expended, to allow the missile's main turbojet to maintain flight)
- Submarines (the **UGM-84**, fitted with a solid-fuel rocket booster and encapsulated in a container to enable submerged launch through a torpedo tube);
- Coastal defense batteries, from which it would be fired with a solid-fuel rocket booster.

### 10.8.1 Development

In 1965 the U.S. Navy began studies for a missile in the 45 km (25 nm) range class for use against surfaced submarines. The name Harpoon was assigned to the project (i.e. a harpoon to kill "whales", a naval slang term for submarines). The sinking of the Israeli destroyer *Eilat* in 1967 by a Soviet-built **Styx** anti-ship missile shocked senior United States Navy officers, who until then had not been conscious of the threat posed by anti-ship missiles. In 1970 Chief of Naval Operations Admiral Elmo Zumwalt accelerated the development of Harpoon as part of his "Project Sixty" initiative, hoping to add much needed striking power to US surface combatants. Harpoon was primarily developed for use on US Navy warships such as the *Ticonderoga*-class cruiser as their principal anti-ship weapon system.

The Harpoon has also been adapted for carriage on several aircraft, such as the P-3 Orion, the A-6 Intruder, the S-3 Viking, the AV-8B Harrier II, and the F/A-18 Hornet and U.S. Air Force B-52H bombers. Harpoon was purchased by many American allies, including Pakistan, Japan, Singapore, South Korea, Taiwan, the United Arab Emirates and most NATO countries. It has been carried by several U.S. Air Force aircraft, including the B-52H bomber and F-16 Fighting Falcon.

The Royal Australian Air Force is capable of firing AGM-84 series missiles from its F/A-18F Super Hornets, F/A-18A/B Hornets, and AP-3C Orion aircraft, and previously from the now retired F-111C/Gs. The Royal Australian Navy deploys the Harpoon on major surface combatants and in the *Collins*-class submarines. The Spanish Air Force and the Chilean Navy are also AGM-84D customers, and they deploy the missiles on surface ships, and F/A-18s, F-16s, and P-3 Orion aircraft. The British Royal Navy deploys the Harpoon on several types of surface ship.



*The Canadian frigate HMCS Regina fires a Harpoon anti-ship missile during a Rim of the Pacific (RIMPAC) sinking exercise*

The Royal Canadian Navy carries Harpoon missiles on its *Halifax*-class frigates. The Royal New Zealand Air Force is looking at adding the capability of carrying a stand-off missile, probably Harpoon or AGM-65 Maverick, on

its six P-3 Orion patrol planes once they have all been upgraded to P3K2 standard.

The Republic of Singapore Air Force also operates five modified Fokker 50 Maritime Patrol Aircraft (MPA) which are fitted with the sensors needed to fire the Harpoon missile. The Pakistani Navy carries the Harpoon missile on its naval frigates and P-3C Orions. The Turkish Navy carries Harpoons on surface warships and Type 209 submarines. The Turkish Air Force will be armed with the SLAM-ER.

At least 339 Harpoon missiles were sold to the Republic of China Air Force (Taiwan) for its F-16 A/B Block 20 fleet and the Taiwanese Navy, which operates four guided-missile destroyers and eight guided-missile frigates with the capability of carrying the Harpoon, including the eight former U.S. Navy *Knox*-class frigates and the four former USN *Kidd*-class destroyers which have been sold to Taiwan. The two *Zwaardvis/Hai Lung* submarines and 12 P-3C Orion aircraft can also use the missile. The eight *Cheng Kung*-class frigate, despite being based on the US *Oliver Hazard Perry*-class class, have Harpoon capabilities deleted from their combat systems, and funding to restore it has so far been denied.

The Block 1 missiles were designated AGM/RGM/UGM-84A in US service and UGM-84B in the UK. Block 1B standard missiles were designated AGM/RGM/UGM-84C, Block 1C missiles were designated AGM/RGM/UGM-84D. Block 1 used a terminal attack mode that included a pop-up to approximately 1800m before diving on the target; Block 1B omitted the terminal pop-up; and Block 1C provided a selectable terminal attack mode.<sup>\*[3]</sup>

### Harpoon Block 1D

This version featured a larger fuel tank and re-attack capability, but was not produced in large numbers because its intended mission (warfare with the Warsaw Pact countries of Eastern Europe) was considered to be unlikely following the events of 1991–92. Range is 278 km. Block 1D missiles were designated RGM/AGM-84F.

### SLAM ATA (Block 1G)

This version, under development, gives the SLAM a re-attack capability, as well as an image comparison capability similar to the Tomahawk cruise missile; that is, the weapon can compare the target scene in front of it with an image stored in its on-board computer during terminal phase target acquisition and lock on (this is known as DSMAC).<sup>\*[4]</sup> Block 1G missiles AGM/RGM/UGM-84G; the original SLAM-ER missiles were designated AGM-84H (2000-2002) and later ones the AGM-84K (2002 onwards).

### Harpoon Block 1J

Block 1J was a proposal for a further upgrade, AGM/RGM/UGM-84J Harpoon (or Harpoon 2000), for use against both ship and land targets.

### Harpoon Block II



*Loading Mk 141 canister launcher*

In production at Boeing facilities in Saint Charles, Missouri, is the Harpoon Block II, intended to offer an expanded engagement envelope, enhanced resistance to electronic countermeasures and improved targeting. Specifically, the Harpoon was initially designed as an open-ocean weapon. The Block II missiles continue progress begun with Block IE, and the Block II missile provides the Harpoon with a littoral-water anti-ship capability.

The key improvements of the Harpoon Block II are obtained by incorporating the inertial measurement unit from the Joint Direct Attack Munition program, and the software, computer, Global Positioning System (GPS)/inertial navigation system and GPS antenna/receiver from the SLAM Expanded Response (SLAM-ER), an upgrade to the SLAM.

The US Navy awarded a \$120 million contract to Boeing in July 2011 for the production of about 60 Block II Harpoon missiles, including missiles for 6 foreign militaries.<sup>\*[1]</sup> Boeing lists 30 foreign navies as Block II customers.<sup>\*[1]</sup>

India acquired 24 Harpoon Block II missiles to arm its maritime strike Jaguar fighters in a deal worth \$170 million through the Foreign Military Sales system.<sup>\*[5]</sup> In December 2010, the Defense Security Cooperation Agency (DSCA) notified U.S. Congress of a possible sale of 21 additional AGM-84L HARPOON Block II Missiles and associated equipment, parts and logistical support for a complete package worth approximately \$200 million; the Indian government intends to use these missiles on its Indian Navy P-8I Neptune maritime patrol aircraft.<sup>\*[6]</sup> Indian Navy is also planning to upgrade the fleet of four submarines – Shishumar class submarine – with tube-launched Harpoon missiles.<sup>\*[7]</sup>

Harpoon Block 2 missiles are designated

AGM/RGM/UGM-84L.

On 18 November 2015, the U.S. Navy tested the AGM-84N Harpoon Block II+ missile against a moving ship target. The Block II+ incorporates an improved GPS guidance kit and a net-enabled **data-link** that allows the missile to receive in-flight targeting updates. The Block II+ is planned to enter service in 2017.\*[8]

### **Harpoon Block III**

Harpoon Block III was intended to be an upgrade package to the existing USN Block 1C missiles and Command Launch Systems (CLS) for guided-missile cruisers, guided-missile destroyers, and the F/A-18E/F Super Hornet fighter aircraft. After experiencing an increase in the scope of required government ship integration, test and evaluation, and a delay in development of a data-link, the Harpoon Block III program was canceled by the U.S. Navy in April 2009.

### **Harpoon Next Generation**

In April 2015, Boeing unveiled a modified version of the RGM-84 it calls the Harpoon Next Generation. It increases the ship-launched Harpoon missile's range from the Block II's 70 nmi (81 mi; 130 km) to 130 nmi (150 mi; 240 km), along with a new lighter 300 lb (140 kg) warhead a more fuel-efficient engine with electronic fuel controls. Boeing is offering the missile as the U.S. Navy's Littoral Combat Ship frigate upgrade over-the-horizon anti-ship missile as a cost-effective missile upgrade option; complete Next Gen Harpoons would cost approximately as much as a Block II at \$1.2 million each, with upgrades for an existing missile costing half that. The Harpoon Next Generation will likely compete against the Kongsberg/Raytheon Naval Strike Missile and could be ready for service by 2017.\*[9]\*[2]\*[10]

### **10.8.2 Operational history**

- Block I coastal missile defense system truck, in service in the **Danish Navy** 1988–2003.
- A Harpoon missile is launched from the **Ticonderoga-class cruiser** USS *Shiloh* during a live-fire exercise in 2014.

In 1981 and 1982 there were two accidental launches of Harpoon missiles: one by the USN and the other by the **Danish Navy**, which destroyed and damaged buildings in the recreational housing area Lumsås. The Danish missile was later known as the *hovsa-missile* (*hovsa* being the Danish term for *oops*).

In November 1980 during Operation Morvarid Iranian missile boats attacked and sank two Iraqi **Osa-class** mis-

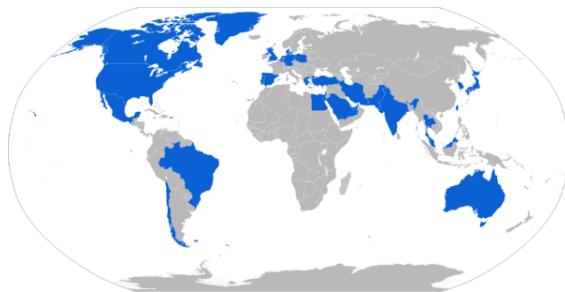
sile boats; one of the weapons used was the Harpoon missile.

In 1986, the **United States Navy** sank at least two Libyan patrol boats in the **Gulf of Sidra**. Two Harpoon missiles were launched from the **USS Yorktown** with no confirmed results and several others from **A-6 Intruder** aircraft that were said to have hit their targets.\*[11]\*[12] Initial reports claimed that the **USS Yorktown** scored hits on a patrol boat, but action reports indicated that the target may have been a false one and that no ships were hit by those missiles.\*[13]

In 1988, Harpoon missiles were used to sink the Iranian frigate *Sahand* during **Operation Praying Mantis**. Another was fired at the **Kaman-class** missile boat *Joshan*, but failed to strike because the fast attack craft had already been mostly sunk by **RIM-66 Standard** missiles. An Iranian-owned Harpoon missile was also fired at the guided missile cruiser **USS Wainwright**. The missile was successfully lured away by chaff.\*[14]

In December 1988, a Harpoon launched by an **F/A-18 Hornet** fighter from the aircraft carrier **USS Constellation**\*[15] killed one sailor when it struck the merchant ship *Jagvivek*, a 250 ft (76 m) long Indian-owned ship, during an exercise at the **Pacific Missile Range** near Kauai, **Hawaii**. A **Notice to Mariners** had been issued warning of the danger, but *Jagvivek* left port before receiving the communication and subsequently strayed into the test range area, and the Harpoon missile, loaded just with an inert dummy warhead, locked onto it instead of its intended target.

In June 2009, it was reported by an American newspaper, citing unnamed officials from the Obama administration and the **U.S. Congress**, that the American government had accused **Pakistan** of illegally modifying some older Harpoon missiles to strike land targets. Pakistani officials denied this and they claimed that the US was referring to a new Pakistani-designed missile. Some international experts were also reported to be skeptical of the accusations. Robert Hewson, editor of **Jane's Air Launched Weapons**, pointed out that the Harpoon is not suitable for the land-attack role due to deficiency in range. He also stated that Pakistan was already armed with more sophisticated missiles of Pakistani or Chinese design and, therefore, “beyond the need to reverse-engineer old US kit.” Hewson offered that the missile tested by Pakistan was part of an undertaking to develop conventionally armed missiles, capable of being air- or surface-launched, to counter its rival India’s missile arsenal.\*[16]\*[17]\*[18] It was later stated that Pakistan and the US administration had reached some sort of agreement allowing US officials to inspect Pakistan’s inventory of Harpoon missiles,\*[19]\*[20] and the issue had been resolved.\*[21]



Map with Harpoon operators in blue



*Australia Anzac-class frigate, HMAS Toowoomba*

### 10.8.3 Operators

#### Current operators

##### Australia

- Royal Australian Air Force
  - F/A-18 Hornet
  - F/A-18F Super Hornet
  - AP-3C Orion
- Royal Australian Navy
  - *Hobart* class Destroyer
  - *Adelaide* class frigate

- *Anzac* class frigate
- *Collins* class submarine

##### Belgium

- Belgian Navy
  - *Karel Doorman* class frigate

##### Brazil

- Brazilian Air Force
  - P-3AM

##### Canada

- Royal Canadian Air Force
  - CF-18 Hornet
  - CP-140 Aurora
- Royal Canadian Navy
  - *Halifax* class frigate

##### Chile

- Chilean Navy
- Chilean Air Force

##### Denmark

- Royal Danish Navy
  - *Absalon* class support ship
  - *Ivar Huitfeldt* class frigate

##### Egypt

- Egyptian Air Force
- Egyptian Navy

##### Germany

- German Navy
  - *Sachsen* class frigate (F124)
  - *Bremen* class frigate (F122)

 **Greece**

- Hellenic Navy
  - *Elli* class frigate
  - *Hydra* class frigate
  - Type 209 submarine, *Glafkos* class (1100) and *Poseidon* class (1200)
  - *Papanikolis* Type 214 class submarine

 **Iran**

- Islamic Republic of Iran Navy (nearly retired, most replaced by Russian-made AS-20 and Chinese-made C-802 ASMs)

 **Israel**

- Israeli Air Force
- Israeli Navy

 **India**

- Indian Navy
  - Boeing P-8I Neptune
  - Shishumar class submarine (Type-209)<sup>\*</sup>[22]
- Indian Air Force
  - *Jaguar* aircraft

**● Japan**

- Japan Maritime Self Defense Force(Japanese Navy)
  - P-1
  - P-3C
  - Kongō-class destroyer

 **Republic of Korea**

- Republic of Korea Air Force
  - *F-15K*
  - *KF-16*
- Republic of Korea Navy
  - *Sejong the Great* Class destroyer

- *Chungmugong Yi Sun-shin* class destroyer
- *Gwanggaeto the Great* class destroyer
- *Son Won-Il* class Submarine
- *Chang Bogo* class Submarine

 **Malaysia**

- Royal Malaysian Air Force

 **Mexico**

- Mexican Navy

 **Netherlands**

- Royal Netherlands Navy

 **Pakistan**

- Pakistan Navy

 **Poland**

- Polish Navy

 **Portugal**

- Portuguese Navy

 **Saudi Arabia**

- Royal Saudi Navy

 **Singapore**

- Republic of Singapore Air Force
- Republic of Singapore Navy

 **Spain**

- Spanish Air Force
- Spanish Navy

 **Republic of China**

- Republic of China Air Force
  - F-16A/B Block 20
- Republic of China Navy
  - *Keelung* Class Destroyer
  - *Chih Yang* Class Frigate
  - *Hai Lung* Class Submarine



*Harpoon Block II test firing from USS Thorn.*

 **Thailand**

- Royal Thai Navy

 **Turkey**

- Turkish Air Force
- Turkish Navy

 **United Arab Emirates**

 **United Kingdom**

- Royal Navy
- Royal Air Force (retired)



*UGM-84 submarine launch*

 **United States**

- United States Air Force
- United States Navy
- United States Coast Guard (retired)



*AGM-84D being prepared for P-3 Orion weapons pylon.*

**10.8.4 General characteristics**

- **Primary function:** Air-, surface-, or submarine-launched anti-surface (anti-ship) missile
- **Contractor:** The McDonnell Douglas Astronautics Company – East
- **Power plant:** Teledyne CAE J402 turbojet, 660 lb (300 kg)-force (2.9 kN) thrust, and a solid-propellant booster for surface and submarine launches
- **Length:**

- **Air-launched:** 3.8 metres (12 ft)
- **Surface and submarine-launched:** 4.6 metres (15 ft)
- **Weight:**
  - **Air-launched:** 519 kilograms (1,144 lb)
  - **Submarine or ship launched from box or canister launcher:** 628 kilograms (1,385 lb)
- **Diameter:** 340 millimetres (13 in)

- **Wing span:** 914 millimetres (36.0 in)
- **Maximum altitude:** 910 metres (2,990 ft) with booster fins and wings
- **Range:** Over-the-horizon (approx 50 nautical miles)
  - AGM-84D (Block 1C): 220 km (120 nmi)
  - RGM/UGM-84D (Block 1C): 140 km (75 nmi)
  - AGM-84E (Block 1E) : 93 km (50 nmi)
  - AGM-84F (Block 1D): : 315 km (170 nmi)
  - RGM-84F (Block 1D): 278 km (150 nmi)
  - RGM/AGM-84L (Block 2): 278 km (150 nmi)
  - AGM-84H/K (Block 1G / Block 1J): 280 km (150 nmi)
- **Speed:** High subsonic, around 850 km/h (460 knots, 240 m/s, or 530 mph)
- **Guidance:** Sea-skimming cruise monitored by radar altimeter, active radar terminal homing
- **Warhead:** 221 kilograms (487 lb), penetration high-explosive blast
- **Unit cost:** US\$1,527,416
- **Date deployed:**
  - Ship-launched (RGM-84A): 1977
  - Air-launched (AGM-84A): 1979
  - Submarine-launched (UGM-84A): 1981
  - SLAM (AGM-84E): 1990
  - SLAM-ER (AGM-84H): 1998 (delivery); 2000 (initial operational capability (IOC))
  - SLAM-ER ATA (AGM-84K): 2002 (IOC)

## 10.8.5 See also

- Exocet
- Brahmos
- Sea Eagle
- RBS-15
- SS-N-25
- YJ-12
- C-802
- Type 90 Ship-to-Ship Missile
- Long Range Anti-Ship Missile

## 10.8.6 References

- [1] “Backgrounder – Harpoon Block II” (PDF). Boeing. Retrieved 2014-05-11.
- [2] Who Will Supply the US Navy's Next Anti-Ship Missile? - Thediplomat.com, 20 April 2015
- [3] “Directory of U.S. Military Rockets and Missiles” . Andreas Parsch.
- [4] Global Security Harpoon article
- [5] “Military pacts on hold but India, US continue with exercises, arms deals” . *The Times Of India*. September 22, 2010.
- [6] “India to Receive AGM-84L HARPOON Block II Missiles Worth \$200 Million” . *defpro.com*. December 23, 2010.
- [7] “Navy plans missiles for four submarines” . Jun 20, 2012.
- [8] U.S. Navy Completes Flight Test of New Network-Enabled AGM-84N Harpoon Block II+ Missile - Navyrecognition.com, 22 November 2015
- [9] Boeing Will Offer Modified Harpoon Missile for Littoral Combat Ships - News.USNI.org, 16 April 2015
- [10] Next-Generation Harpoon Missile Offered to Navy - DoDBuzz.com, 12 May 2015
- [11] Time (magazine). High-Tech Firepower. April 7, 1986.
- [12] Ronald Reagan. Letter to the Speaker of the House of Representatives and the President Pro Tempore of the Senate on the Gulf of Sidra Incident. March 26, 1986.
- [13] The New York Times. PENTAGON REVISES LIBYAN SHIP TOLL. March 27, 1986.
- [14] The New York Times. U.S. STRIKES 2 IRANIAN OIL RIGS AND HITS 6 WARSHIPS IN BATTLES OVER MINING SEA LANES IN GULF. April 19, 1988.
- [15] The New York Times / AP. U.S. Rocket Hits Indian Ship Accidentally, Killing Crewman. December 13, 1988.
- [16] The New York Times. US Says Pakistan Made Changes to Missiles Sold for Defense August 29, 2009
- [17] Rediff.com / PTI. Pakistan illegally modified Harpoon missile: Report. August 30, 2009.
- [18] The Times of India / PTI. Harpoon missile modification by Pak very serious: US. September 1, 2009.
- [19] Dawn News. <http://www.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/pakistan/09-pakistan-allows-us-to-inspect-harpoons--szh-11>
- [20] India TV News. <http://www.indiatvnews.com/main/newsdetails.php?id=3479&pg=index>
- [21] <http://thenews.jang.com.pk/updates.asp?id=87764>
- [22] “US agrees to sell 22 Harpoon missiles to India for \$200 Mn” . IANS. news.biharprabha.com. Retrieved 3 July 2014.

### 10.8.7 External links

- Official Harpoon information – Boeing website
- Detailed information of all Harpoon versions and upgrades – From Encyclopedia Astronautica
- AGM-84 variants
- McDonnell-Douglas AGM-84A Harpoon and AGM-84E SLAM
- FAS Harpoon article
- Global Security Harpoon article
- Boeing Harpoon Block III Press Release
- Boeing Harpoon Block II Backgrounder
- Royal Netherlands Navy launches Harpoons from new frigate HMS De Ruyter (Defense-Aerospace)

## 10.9 M2 Browning

This article is about the .50 caliber M2 machine gun. For the Browning .30-06 machine gun, see [M1919 Browning machine gun](#).

The **M2 Machine Gun or Browning .50 Caliber Machine Gun** is a heavy machine gun designed towards the end of World War I by John Browning. Its design is similar to Browning's earlier M1919 Browning machine gun, which was chambered for the .30-06 cartridge. The M2 uses the much larger and much more powerful .50 BMG cartridge, which was developed alongside and takes its name from the gun itself (BMG standing for *Browning Machine Gun*). It has been referred to as "Ma Deuce",<sup>\*[6]</sup> in reference to its M2 nomenclature. The design has had many specific designations; the official designation for the current infantry type is **Browning Machine Gun, Cal. .50, M2, HB, Flexible**. It is effective against infantry, unarmored or lightly armored vehicles and boats, light fortifications and low-flying aircraft. The M2 machine gun has been produced longer than any other machine gun.

The Browning .50 caliber machine gun has been used extensively as a vehicle weapon and for aircraft armament by the United States from the 1930s to the present. It was heavily used during World War II, the Korean War, the Vietnam War, the Falklands War, the Iraq War and the War in Afghanistan in the 2000s and 2010s. It is the primary heavy machine gun of NATO countries, and has been used by many other countries. The M2 has been in use longer than any other small arm in U.S. inventory except the .45 ACP M1911 pistol, also designed by John Browning.

The current M2HB is manufactured in the United States by General Dynamics<sup>[7]</sup> and U.S. Ordnance<sup>[8]</sup> for use

by the United States government, and for U.S. Foreign Allies via FMS sales.

### 10.9.1 History

Machine guns were heavily used in World War I, and weapons of larger than rifle caliber were appearing. Both the British and French had large caliber machine guns. The larger rounds were needed to defeat the armor that was being introduced to the battlefield. Armor was also appearing in the skies. During World War I, the Germans introduced a heavily armored airplane, the **Junkers J.I**. The armor made aircraft machine guns using conventional rifle ammunition (such as the .30-06) ineffective.<sup>\*[9]</sup>

Consequently, the American Expeditionary Force's commander General John J. Pershing asked for a larger caliber machine gun.<sup>\*[10]</sup> Pershing asked the Army Ordnance Department to develop a machine gun with a caliber of at least 0.50 inches (12.7 mm) and a muzzle velocity of at least 2,700 feet per second (820 m/s).<sup>\*[9]</sup> U.S. Col. John Henry Parker, commanding a machine gun school in France, observed the effectiveness of a French 11 mm (0.43 in) incendiary armor-piercing round. The Army Ordnance Department ordered eight experimental Colt machine guns rechambered for the French 11-mm cartridge.<sup>\*[11]</sup> The French had developed a prototype machine gun for an even larger caliber.

The French 11-mm round was found to be unsuitable because its velocity was too low. Pershing wanted a bullet of at least 670 gr (43 g) and a muzzle velocity of 2,700 ft/s (820 m/s). Development with the French round was dropped.<sup>\*[11]</sup>

Around July 1917, John M. Browning started redesigning his .30 caliber machine gun for a larger caliber. Winchester worked on the cartridge, which was a scaled-up version of the .30-06. Winchester initially added a rim to the cartridge because the company wanted to use the cartridge in an anti-tank rifle, but Pershing insisted the cartridge be rimless.<sup>\*[11]</sup> The first .50 machine gun underwent trials on 15 October 1918. It fired at less than 500 rounds per minute, and the muzzle velocity was only 2,300 ft/s (700 m/s). Cartridge improvements were promised.<sup>\*[12]</sup> The gun was heavy, difficult to control, fired too slowly for anti-personnel, and was not powerful enough against armor.<sup>\*[13]</sup>

While the .50 was being developed, some German anti-tank rifles and ammunition were seized. The German rounds had a muzzle velocity of 2,700 ft/s (820 m/s), an 800 gr (52 g) bullet, and could pierce 1 in (25 mm) at 250 yd (230 m).<sup>\*[14]</sup> Winchester made the .50 caliber round have similar performance. Ultimately, the muzzle velocity was 2,750 ft/s (840 m/s).<sup>\*[15]</sup>

Efforts by John M. Browning and Fred T. Moore resulted in the water-cooled Browning machine gun, caliber .50,

M1921. An aircraft version was termed the Browning aircraft machine gun, caliber .50, M1921. These guns were used experimentally from 1921 until 1937. They had light-weight barrels and the ammunition only fed from the left side. Service trials raised doubts whether the guns would be suitable for aircraft or for anti-aircraft use. A heavy barrel M1921 was considered for ground vehicles.\*[16]

John M. Browning died in 1926. Between 1927 and 1932, Dr. S.H. Green studied the design problems of the M1921 and the needs of the armed services. The result was a single receiver design that could be turned into seven types of .50 caliber machine guns by using different jackets, barrels, and other components. The new receiver allowed right or left hand feed. In 1933, Colt manufactured several prototype Browning machine guns (including what would be known as the M1921A1 and M1921E2). With support from the Navy, Colt started manufacturing the M2 in 1933.\*[17] FN Herstal (Fabrique Nationale) has manufactured the M2 machine gun since the 1930s.\*[18] General Dynamics, U.S. Ordnance, and Manroy Engineering (UK) are other current manufacturers.

A variant without a water jacket, but with a thicker-walled, air-cooled barrel was designated the M2 HB (*HB* for *Heavy Barrel*). The added mass and surface area of the heavy barrel compensated somewhat for the loss of water-cooling, while reducing bulk and weight: the M2 weighs 121 lb (55 kg) with a water jacket, but the M2 HB weighs 84 lb (38 kg). Due to the long procedure for changing the barrel, an improved system was developed called QCB (quick change barrel). The lightweight “Army/Navy” prefixed AN/M2 “light-barrel” version of the Browning M2 weighing 60 pounds (27 kg) was also developed, and became the standard .50-caliber aviation machine gun of the World War II-era for American military aircraft of nearly every type,\*[19] readily replacing Browning's own air-cooled .30 caliber machine gun design in nearly all American aircraft installations.

### 10.9.2 Design details

The Browning M2 is an air-cooled, belt-fed machine gun. The M2 fires from a closed bolt, operated on the short recoil principle. The M2 fires the .50 BMG cartridge, which offers long range, accuracy and immense stopping power. The closed bolt firing cycle made the M2 usable as a synchronized machine gun on aircraft before and during World War II, as on the early versions of the Curtiss P-40 fighter.

The M2 is a scaled-up version of John Browning's M1917 .30 caliber machine gun, even using the same timing gauges.

### Features

The M2 has varying cyclic rates of fire, depending on the model. The M2HB (heavy barrel) air-cooled ground gun has a cyclical rate of 450-575 rounds per minute.\*[20] The early M2 water-cooled AA guns had a cyclical rate of around 450–600 rpm.\*[21] The AN/M2 aircraft gun has a cyclic rate of 750–850 rpm; this increases to 1,200 rpm or more for AN/M3 aircraft guns fitted with electric or mechanical feed boost mechanisms.\*[5] These maximum rates of fire are generally not achieved in use, as sustained fire at that rate will wear out the bore within a few thousand rounds, necessitating replacement. In addition to full automatic, the M2HB can be selected to fire single-shots or at less than 40 rounds per minute, or rapid fire for more than 40 rounds per minute. Slow and rapid firing modes use 5-7 round bursts with different lengths of pause between bursts.\*[22]



A U.S. Marine mans a .50 caliber machine gun as part of a security force during a training exercise with the 24th Marine Expeditionary Unit in November 2002.

The M2 has an effective range of 1,830 metres (2,000 yd) and a maximum effective range of 2,000 metres (2,200 yd) when fired from the M3 tripod. In its ground-portable, crew-served role as the M2HB, the gun itself weighs 84 pounds (38 kg) and the assembled M3 tripod another 44 pounds (20 kg). In this configuration, the V-shaped “butterfly” trigger is located at the very rear of the weapon with a “spade handle” hand-grip on either side of it and the bolt release in the center. The spade handles are gripped and the butterfly trigger is depressed with one or both thumbs. Recently, new rear buffer assemblies have used squeeze triggers mounted to the hand grips, doing away with the butterfly triggers.

When the bolt release is locked down by the bolt latch release lock on the buffer tube sleeve, the gun functions in fully automatic mode. Conversely, the bolt release can be unlocked into the up position resulting in single-shot firing (the gunner must press the bolt latch release to send the bolt forward). Unlike virtually all other modern machine guns, it has no safety (although a sliding safety switch has recently been fielded to USMC armorers for installation on their weapons and is standard-issue for the

U.S. Army for all M2s). Troops in the field have been known to add an improvised safety measure against accidental firing by slipping an expended shell casing under the butterfly trigger.\*[23] The upgraded M2A1 has a manual trigger block safety.



*Twin M2HB .50 caliber machine gun during a Pre-aimed Calibration Fire (PACFIRE) exercise in May 2005*

Because the M2 was intentionally designed to operate in many configurations, it can be adapted to feed from the left or right side of the weapon by exchanging the belt-holding pawls, and the front and rear cartridge stops (three-piece set to include link stripper), then reversing the bolt switch. The operator must also convert the top-cover belt feed slide assembly from left to right hand feed as well as the spring and plunger in the feed arm. This will take a well trained individual less than two minutes to perform.

The charging assembly may be changed from left to right hand charge. A right hand charging handle spring, lock wire and a little know how are all that are required to accomplish this. The M2 can be battle ready and easily interchanged if it is preemptively fitted with a retracting slide assembly on both sides of the weapon system. This eliminates the need to have the weapon removed from service to accomplish this task.

### Ammunition

There are several different types of ammunition used in the M2HB and AN aircraft guns. From World War II

through the Vietnam War, the big Browning was used with standard ball, armor-piercing (AP), armor-piercing incendiary (API), and armor-piercing incendiary tracer (APIT) rounds. All .50 ammunition designated “armor-piercing” was required to completely perforate 0.875 inches (22.2 mm) of hardened steel armor plate at a distance of 100 yards (91 m) and 0.75 inches (19 mm) at 547 yards (500 m).\*[24] The API and APIT rounds left a flash, report, and smoke on contact, useful in detecting strikes on enemy targets; they were primarily intended to incapacitate thin-skinned and lightly armored vehicles and aircraft, while igniting their fuel tanks.\*[25]

Current ammunition types include M33 Ball (706.7 grain) for personnel and light material targets, M17 tracer, M8 API (622.5 grain), M20 API-T (619 grain), and M962 SLAP-T. The latter ammunition along with the M903 SLAP (Saboted Light Armor Penetrator) round can perforate 1.34 inches (34 mm) of HHA (face-hardened steel plate) at 500 metres (550 yd), 0.91 inches (23 mm) at 1,200 metres (1,300 yd), and 0.75 inches (19 mm) at 1,500 metres (1,600 yd). This is achieved by using a 0.30-inch-diameter (7.6 mm) tungsten penetrator. The SLAP-T adds a tracer charge to the base of the ammunition. This ammunition was type classified in 1993.\*[26]\*[27]

When firing blanks, a large **blank-firing adapter** (BFA) of a special type must be used to allow the recoil operated action to cycle. This functions on the principle of a recoil booster, to increase the recoil force acting on the short recoil action. This is the exact antithesis of a **muzzle brake**. Without this adaptor, the reduced-charge blank cartridge would develop too little recoil to cycle the action fully. The adapter is very distinctive, attaching to the muzzle with three rods extending back to the base. The BFA can often be seen on M2s during peacetime operations.

### 10.9.3 Deployment

The M2 .50 Browning machine gun has been used for various roles:

- A medium infantry support weapon
- As an light anti-aircraft (AA) gun in some ships; up to six M2 guns could be mounted on the same turret.
- As an anti-aircraft gun on the ground. The original water-cooled version of the M2 was used on a tall AA tripod or vehicle-mounted anti-aircraft weapon on a sturdy pedestal mount. In later variants, twin and quadruple M2HB Brownings were used, such as the **M45 Quadmount** used on the US **M16 half-track** carrier. Twin or quad-mount .50 M2 guns normally used alternating left-hand and right-hand feed.
- Primary or secondary weapon on an armored fighting vehicle.



An M2 fired from a rigid-hulled inflatable boat.



B-25H "Barbie III" showing four M2 feeds and 75mm M5 gun

- Primary or secondary weapon on a naval patrol boat.
- Spotting for the primary weapon on some armored fighting vehicles.
- Secondary weapon for anti-boat defense on large naval vessels (corvettes, frigates, destroyers, cruisers, etc.).
- Coaxial gun or independent mounting in some tanks.
- Fixed-mounted forward-firing primary aircraft armament (AN/M2 and AN/M3 light-barrel versions

only). The AN/M2 was used as primary armament in almost all World War II U.S. pursuit aircraft (such as the P-51 Mustang, P-47 Thunderbolt, P-38 Lightning, P-39 Airacobra, P-40 Tomahawk, F6F Hellcat and F4U Corsair). It was also used in fixed mountings in bombers and ground attack aircraft like the SBD Dauntless dive bomber, TBF Avenger torpedo bomber, and medium bombers such as B-25 Mitchell, B-26 Marauder and A-26 Invader. The later, faster-firing electrically feed-boosted AN/M3 was used in many Korean War-era U.S.A.F. fighter aircraft such as the F-80 Shooting Star, F-84 Thunderjet, F-86 Sabre, and early versions of the B-57 Canberra bomber. The US Navy had largely completed their move to the (unrelated) M2/AN 20mm autocannon for aircraft armament by this time.

- Turret-mount or flexible-mounted defensive armament, again only with the AN/M2 light-barrel version, in almost all US World War II-era bombers and patrol aircraft such as the B-17 Flying Fortress, B-24 Liberator and B-29 Superfortress heavy bombers, B-25 Mitchell and B-26 Marauder medium bombers, PBY Catalina patrol flying boats, TBF/TBM Avenger torpedo bombers, and in a combined offensive/defensive turret mounting in many Northrop P-61 Black Widow night fighters. The AN/M3 was used as a flexible, quad-mounted, radar-directed tail-defence gun as late as 1980 on the B-52 Stratofortress, until replaced by 20mm M61 Vulcan Gatling type cannon
- Variants of the AN/M3 are used as flexible door guns or as flexible remotely-controlled armament subsystems on many US Army, Navy, Marine Corps and Coast Guard helicopters, such as the UH-1 Iroquois, UH-60 Blackhawk and variants, CH-53 Super Stallion, OH-58 Kiowa Warrior and others.

#### United States



A U.S. soldier in Normandy stands guard with the M2HB installed on a dual-purpose mounting.

At the outbreak of the Second World War the United States had versions of the M2 in service as fixed aircraft guns, anti-aircraft defensive guns (on aircraft, ships, or boats), infantry (tripod-mounted) guns, and as dual purpose anti-aircraft and anti-vehicular weapons on vehicles.\* [28]\* [29]

The .50 AN/M2 light-barrel aircraft Browning used in planes had a rate of fire of approximately 800 rounds per minute, and was used singly or in groups of up to eight guns for aircraft ranging from the P-47 Thunderbolt to the B-25 Mitchell bomber, which in the last J-version of the Mitchell could have upwards of fourteen M2s firing forward for ground attack missions - eight in a solid metal-structure nose, four more mounted in a pair of conformal twin-gunned gun pods on the lower cockpit sides, and two more if the forward dorsal turret's pair of M2 guns were also aimed straight forward.

In the dual-purpose vehicle mount, the M2HB (heavy barrel) proved extremely effective in U.S. service: the Browning's .50 caliber AP and API rounds could easily penetrate the engine block or fuel tanks of a German Bf 109 fighter attacking at low altitude,\* [30] or perforate the hull plates and fuel tanks of a German half-track or light armored car.\* [24]\* [31]\* [32] While the dual-purpose mounting was undeniably useful, it did normally require the operator to stand when using the M2 in a ground role, exposing him to return fire.\* [33] Units in the field often modified the mountings on their vehicles, especially tanks and tank destroyers, to provide more operator protection in the anti-vehicular and anti-personnel role.\* [34] The weapon was particularly hated by the Germans, whose attacks and ambushes against otherwise helpless stalled motor convoys were frequently broken up by .50 caliber machine gun fire.\* [35]\* [36] Vehicles would frequently "recon by fire" with the M2 Browning, i.e. they would fire continuously at suspected points of ambush while moving through areas still containing enemy forces. One vehicle would fire exclusively to the right, the following vehicle to the left, the next one to the right, and so on in order to cover both flanks of the advancing convoy.

Besides vehicle-mounted weapons, the heavy weapons companies in a World War II U.S. Army infantry battalion or regiment were each issued one M2 Browning with tripod (ground) mount.\* [37] Mounted on a heavily sandbagged tripod, the M2HB proved very useful in either a defensive role or to interdict or block road intersections from use by German infantry and motorized forces.\* [38] Hearing the sound of an M2 could often cause enemy infantry to take cover.\* [39] There are numerous instances of the M2 Browning being used against enemy personnel, particularly infantry assaults\* [40] or for interdiction or elimination of enemy artillery observers or snipers at distances too great for ordinary infantry weapons.\* [41]\* [42]\* [43]

The M2HB was not widely used in the Pacific campaign



An M2 overlooking the Korengal Valley at Firebase Phoenix, Afghanistan, in 2007

for several reasons, including the weight of the gun, the nature of infantry jungle combat, and because road intersections were usually easily outflanked.\* [44] However, it was used by fast-moving motorized forces in the Philippines to destroy Japanese blocking units on the advance to Manila.\* [38] The quad mount .50 was also used to destroy Japanese emplacements.\* [45]

The M2HB was used in Korea and Vietnam, and later in both Operation Desert Storm, the Afghan theater of Operation Enduring Freedom and in Iraq. In 2003, U.S. Army SFC Paul Ray Smith used his M2HB mounted on an M113 armored personnel carrier to kill 20 to 50 enemies who were attacking a U.S. outpost, preventing an aid station from being overrun and allowing wounded soldiers to be evacuated.\* [46] SFC Smith was killed during the firefight and was posthumously awarded the Medal of Honor.

**M45 Quadmount** Main article: [M45 Quadmount](#)  
The M45 Quadmount was a mounting of four .50 M2HB



M16 .50 AA Quad aka the 'Meat Chopper'

guns with a single gunner situated behind an armored housing. This was used by U.S. AA battalions, fitted either on a towed trailer or mounted in a half-track car-

rier (M16 AA half-track). With 200 rounds per gun in a powered tracking mount, the guns proved very effective against low-flying aircraft. The use of four guns adequately compensated for the fact that the individual M2HB's rate of fire (450–550 rounds per minute) was low for an effective anti-aircraft weapon.\*[47]

Towards the end of the war, as Luftwaffe attacks became less frequent, the quad .50 (nicknamed the *Meat Chopper* or *Krautmower*\*[47]) was increasingly used in an anti-personnel role, similarly to the earlier-introduced (1940) and more powerful German 20mm Flakvierling. Snipers firing from trees were engaged by the quad gunner at trunk level - the weapon would cut down and destroy the entire tree, and the sniper with it.\*[39]\*[45]

The M45 Quadmount was still in use during the Vietnam War.

### Commonwealth and other forces



Australian M113 with twin mounted M1919 Browning and M2 Browning Quick Change Barrel machine guns.

Commonwealth use of the M2 Browning .50 caliber machine gun (known as the .5 Browning in British and Commonwealth service) was limited in the Second World War, though from 1942 it was standard armament on US-built AFVs provided under lend-lease such as the M4 Sherman, M7 Priest, M8 Greyhound, or M10 Wolverine variously used by British, Canadian, Australian, South African and New Zealand units. Nevertheless, the heavy Browning's effectiveness was praised by many British and Commonwealth soldiers in infantry, armored, and ordnance branches.\*[48]\*[49] Many commanders thought that the .50 Browning the best weapon in its class, certainly the best of the American weapons, including the M1 Garand and carbine.\*[49]\*[50] In North Africa, after Commonwealth units began to obtain sufficient parts, manuals, gauges, and ammunition for the new weapon, the .50 Browning was increasingly used, eventually replacing the 15 mm Besa,\*[49] but in Italy it was often deleted from top turret mountings because the mount exposed the operator to low branches and enemy fire.\*[51]

All LRDGs, and some SAS units used the aircraft (AN/M2) version of the gun, while beam/waist-mounted and turret-mounted Brownings were used later in the war in such aircraft as the Short Sunderland and Lancaster bomber.



USMC M2 fitted with a Leupold CQBSS variable power scope.

After the Second World War, the .50 Browning continued to see action in Korea and other theaters, in aircraft, tripod (ground), ground AA (hip-ring), and vehicle mounts. One of its most notable actions in a ground role was in a fierce battle with a nine-man SAS team at the Battle of Mirbat in Oman in July 1972, where the heavy Browning and its API ammunition was used to help repulse an assault by 250 Yemeni Adoo guerrillas, though the more famous weapon from the battle is a 25 pounder gun.\*[52]

A .50 caliber Browning was installed along with a .30 caliber Browning machine gun in each compact one-man turret on M113 APCs used by the Royal Australian Armoured Corps in South Vietnam.

Nigerian troops have extensively deployed the 50 caliber Browning, mounted on Otokar Cobra APCs, Panhard VBL M11s and Landcruiser gun-trucks in counterinsurgency operations in the Niger Delta, N.E Nigeria, the Jos Plateau and in Mali

### M2 as a sniper rifle

The M2 machine gun has also been used as a long-range sniper rifle, when equipped with a telescopic sight. Soldiers during the Korean War used scoped M2s in the role of a sniper rifle, but the practice was most notably used by US Marine Corps sniper Carlos Hathcock during the Vietnam War. Using an Unertl telescopic sight and a mounting bracket of his own design, Hathcock could quickly convert the M2 into a sniper rifle, using the traversing-and-elevating (T&E) mechanism attached to the tripod. When firing semi-automatically, Hathcock hit man-size targets beyond 1,800 metres (2,000 yd)—twice the range of a standard-caliber sniper rifle of the time (a .30-06 Winchester Model 70). In fact, Hathcock set the record for the longest confirmed kill at 2,250 metres (2,460 yd), a record, which stood until 2002, when it was broken in Afghanistan by Canadian Forces sniper

Arron Perry.\*[53]\*[54]

#### 10.9.4 Variants and derivatives

##### M2 variants



An M2HB in the French Foreign Legion's 2nd Infantry Regiment during an exercise.

The basic M2 was deployed in U.S. service in a number of subvariants, all with separate complete designations as per the US Army system. The basic designation as mentioned in the introduction is Browning Machine Gun, Cal. .50, M2, with others as described below.

The development of the M1921 water-cooled machine gun which led to the M2, meant that the initial M2s were, in fact, water-cooled. These weapons were designated Browning Machine Gun, Cal. .50, M2, Water-Cooled, Flexible. There was no fixed water-cooled version.

Improved air-cooled heavy barrel versions came in three subtypes. The basic infantry model, Browning Machine Gun, Cal. .50, M2, HB, Flexible, a fixed developed for use on the M6 Heavy Tank designated Browning Machine Gun, Cal. .50, M2, HB, Fixed, and a “turret type” whereby “Flexible” M2s were modified slightly for use in tank turrets. The subvariant designation Browning Machine Gun, Cal. .50, M2, HB, TT was only used for manufacturing, supply, and administration identification and separation from flexible M2s.



M2HB heavy machine gun

A number of additional subvariants were developed after the end of the Second World War. The Caliber .50 Machine Gun, Browning, M2, Heavy Barrel, M48 Turret Type was developed for the commander's cupola on

the M48 Patton tank. The cupola mount on the M48A2 and M48A3 was thoroughly disliked by most tankers, as it proved unreliable in service.\*[55] An externally mounted M2 was later adopted for the commander's position on the M1 Abrams tanks. Three subvariants were also developed for use by the U.S. Navy on a variety of ships and watercraft. These included the Caliber .50 Machine Gun, Browning, M2, Heavy Barrel, Soft Mount (Navy) and the Caliber .50 Machine Gun, Browning, M2, Heavy Barrel, Fixed Type (Navy). The fixed types fire from a solenoid trigger and come in left or right hand feed variants for use on the Mk 56 Mod 0 dual mount and other mounts.

##### M2A1



The M2E2 modification with quick-change barrel

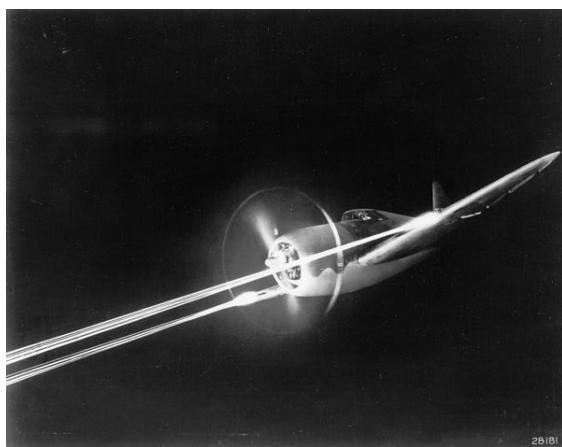
When the M2 was first being designed, John Browning faced two design challenges. With the machine tools available at that time, the dimensions that established the location of the bolt face and the depth of the chamber could not be held tightly enough to control the fit of the cartridge in the chamber. The round can be too tight in the chamber and the gun wouldn't shoot, or be too loose in the chamber resulting in a stoppage or ruptured cartridge. The other dimension that couldn't be held close enough was when the firing pin would fall. The solution to these problems was adjustable timing and headspace; the operator had to screw the barrel into the barrel extension, moving the barrel toward the bolt face to reach the proper headspace with simple gages to allow the operator to adjust to the proper dimensions. By the late 20th century, the M2 was the only adjustable headspace weapon in the U.S. inventory. With rising reports of injuries from improperly headspaced weapons, the U.S. Military held a competition for a quick change barrel conversion kit with fixed timing and headspace in 1997. Three companies offered kits and Saco Defense won the competition. However, funding was lost before the design could be fully evaluated and the program ended. In 2007, the military found money to start a new competition. Saco Defense had since been acquired by General Dynamics, who won the competition.\*[56]

On October 15, 2010, the M2A1 heavy machine gun was type classified by the U.S. Army. Formerly known as the M2E2, the M2A1 incorporates improvements to the design including a quick change barrel (QCB) with

removable carrying handle, a new flash suppressor that reduces muzzle flash by 95 percent, fixed headspace and timing, a modified bolt, and a manual trigger block safety. “Headspace” is the distance between the face of the bolt and the base of the cartridge case, fully seated in the chamber. “Timing” is the adjustment of the gun so that firing takes place when the recoiling parts are in the correct position for firing. When a standard M2 had a barrel change, the headspace and timing had to be manually set. Improper adjustment could damage the weapon and cause serious injury to the user. Fixed headspace and timing reduces risk, and the carrying handle allows the barrel to be switched in seconds.\*[57]\*[58] In June 2011, the Army began conversion of M2HB machine guns to M2A1s.\*[59] In February 2012, the Army announced that it will upgrade all 45,000 M2s to M2A1 standard.\*[60] The M2A1 was named one of the greatest Army inventions of 2011.\*[61] As of November 30, 2012, 8,300 built or converted M2A1s have been fielded by the U.S. Army.\*[62] The U.S. Marine Corps plans to upgrade all of their ground-mounted M2s to M2A1 standard from 2016 to 2018.\*[63]

### 10.9.5 Aircraft guns

#### AN/M2



P-47 firing its eight M2 .50 machine guns during night gunnery

The M2 machine gun was widely used during World War II and in later postwar conflicts as a remote or flexible aircraft gun. For fixed (offensive) or flexible (defensive) guns used in aircraft, a dedicated M2 version was developed called the .50 Browning AN/M2. The “AN” stands for “Army/Navy”, since the gun was developed jointly for use by both services (unusual for the time, when the delineations between the Army and Navy were much stricter, and relations between armed services were often cool, if not outright hostile.) The AN/M2 had a cyclic rate of 750–850 rounds per minute, with the ability to be fired from an electrically operated remote-mount solenoid trigger when installed as a fixed gun. Cooled by



A German Army ramp gunner mans an M3M on board a CH-53 helicopter

the aircraft's slip-stream, the air-cooled AN/M2 was fitted with a substantially lighter 36-inch (91 cm) length barrel, reducing the weight of the complete unit to 61 pounds (28 kg),\* [64] which also had the effect of increasing the rate of fire. The official designation for this weapon was Browning Machine Gun, Aircraft, Cal. .50, AN/M2 (Fixed) or (Flexible). The B-17G Flying Fortress heavy bomber was armed with up to 13 AN/M2 guns in both turreted and flexible positions, with only the later versions of the B-25J Mitchell medium bomber, field-fitted with solid metal noses carrying more AN/M2 guns. These could carry from 14 to 18 M2s, mostly aimed forward for attack duties, with the guns of the forward-located dorsal turret of the B-25H and J models being two of this number.

#### M296

The XM296/M296 is a further development of the AN/M2 machine gun for the OH-58 Kiowa Warrior helicopter. The M296 differs from previous remote firing variants in that it has adjustable firing rate (500–850 rpm), while lacking a bolt latch (allowing single-shot operation).\* [65] As an air-cooled gun used aboard a relatively slow rotary-wing aircraft, the M296 has a burst restriction rate of 50 rounds per minute sustained fire or 150 rounds per minute maximum while conducting peacetime training requirements; the combat firing rate is unrestricted but a ten-minute cooling period after prolonged firing is mandated to avoid stoppages due to overheating.\* [66]

#### XMX213/M213, XM218, GAU-15/A, GAU-16/A, and GAU-18/A

The XMX213/M213 was a modernization and adaptation of existing .50 caliber AN/M2s in inventory for use as a pintle mounted door gun on helicopters using the M59 armament subsystem.

The GAU-15/A, formerly identified as the XM218, is a lightweight member of the M2/M3 family. The GAU-16/A was an improved GAU-15/A with modified grip and sight assemblies for similar applications. Both of these weapons were used as a part of the A/A49E-11 armament subsystem (also known as the Defensive Armament System).

The GAU-18/A, is a lightweight variant of the M2/M3, and is used on the USAF's **MH-53 Pave Low** and **HH-60 Pave Hawk** helicopters. These weapons do not use the M2HB barrel, and are typically set up as left-hand feed, right-hand charging weapons, but on the HH-60 Pave-hawks that use the EGMS (External Gun Mount System) the gun is isolated from the shooter by a recoil absorbing cradle and all weapons are set up as right hand charge but vary between left and right hand feed depending on what side of the aircraft it is on. A feed chute adapter is attached to the left or right hand feed pawl bracket allowing the weapon to receive ammunition through a feed chute system connected to externally mounted ammunition containers holding 600 rounds each.

#### **AN/M3, GAU-21/A, and M3P**

During World War II, a faster-firing Browning was developed for aircraft use. The AN/M3 features a mechanical or electrically boosted feed mechanism to increase the rate of fire to around 1,200 rounds per minute. The AN/M3 was used in Korea on the F-86 Sabre, F-84 Thunderjet and F-80 Shooting Star, and in Vietnam in the XM14/SUU-12/A gun pod. Today, it can be found on the Embraer EMB 314 Super Tucano.

The M3-series is used by the U.S. military in two versions; the M3M and M3P. The fixed, remote-firing version, the FN M3P, is employed on the **Avenger Air Defense System**, and is currently being used on the OH-58D; augmenting the XM296 .50 cal. machine gun.<sup>\*[67]</sup> The M3M flexible machine gun has been adopted by USN under the designation GAU-21/A for use on helicopters. The GAU-21/A is also being used by the United States Marine Corps to upgrade from the XM-218/GAU-16 .50 cal. machine gun for the CH-53E,<sup>\*[68]</sup> on the UH-1Y Venom, and on the Canadian Forces' CH-146 Griffon via the INGRESS upgrade.

#### **10.9.6 Users**

The M2 family has been widely used abroad, primarily in its basic infantry configuration. A brief listing of designations for M2 family weapons follows:

#### **10.9.7 See also**

- M85 machine gun, a vehicle-borne replacement for the M2 that proved unreliable and was removed from

service

- FN BRG-15 extra-large caliber machine gun
- KPV heavy machine gun 14.5 mm caliber machine gun
- List of U.S. Army weapons by supply catalog designation
- MG 131 machine gun, World War II 13 mm German aircraft-mounted gun
- List of individual weapons of the U.S. Armed Forces
- List of crew-served weapons of the U.S. Armed Forces
- DShK, NSV & Kord 12.7 mm machine guns, Soviet/Russian equivalents.
- M45 Quadmount

#### **10.9.8 References**

##### **Notes**

- [1] [https://www.youtube.com/watch?v=LDpvxQe\\_Jhg&list=LLItb2dLp-6NIYuBFI4AwvKg&index=151](https://www.youtube.com/watch?v=LDpvxQe_Jhg&list=LLItb2dLp-6NIYuBFI4AwvKg&index=151)
- [2] “M2 .50 Caliber Machine Gun” . *GlobalSecurity*.
- [3] “Report: Profiling the Small Arms Industry - World Policy Institute - Research Project” . World Policy Institute. November 2000. Retrieved 2010-07-15.
- [4] “FN M2HB-QCB™”. Retrieved 25 December 2014.
- [5] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), pp. 310–311
- [6] Rottman, Gordon (2008). *The Us Army in the Vietnam War 1965–73*. Reading: Osprey Publishing. p. 56. ISBN 1-84603-239-3.
- [7] “Contracts for Friday, September 03, 2010” . Defense.gov. Retrieved 2011-09-19.
- [8] “Contracts for Wednesday, July 15, 2009” . Defense.gov. Retrieved 2011-09-19.
- [9] Chinn 1951, p. 333, stating “The Germans put a heavily armored plane into service during the closing days of World War I. This act made obsolete for all time the rifle-caliber machine gun for aerial use. Some countries were slower to accept the fact than others but nevertheless it cannot be disputed. The United States was among the first to come to this realization.”
- [10] Chinn 1951, pp. 181–182
- [11] Chinn 1951, p. 182
- [12] Chinn 1951, p. 183
- [13] Chinn 1951, p. 184

- [14] Chinn 1951, p. 184. Chinn states that the German round was 12.7-mm anti-tank, but it may have been the 13.2mm TuF round. The Germans were working on their MG 18 TuF heavy machine gun.
- [15] Chinn 1951, p. 186
- [16] Chinn 1951, pp. 333–335
- [17] Chinn 1951, pp. 336–337
- [18] “Major Product Achievements” . Fnherstal.com. Archived from the original on 2011-09-27. Retrieved 2011-09-19.
- [19] “Skylighters, The Web Site of the 225th AAA Searchlight Battalion: AAA Weapons in Focus - The M2 .50-Caliber Machine Gun” . Skylighters.org. Retrieved 2008-09-08.
- [20] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), pp. 310–311: the official rate during WWII was 450–575 rpm, but it was extremely rare to encounter a M2HB that exceeded 550 rpm.
- [21] DiGiulian, Tony, *USA 0.50"/90 (12.7 mm) M2 Browning Machine Gun* (2007) Article
- [22] FM 23-65, “Browning Machine Gun Caliber .50 HB, M2” United States Department of the Army, December 2002.
- [23] Crew Served Weapons lesson plan
- [24] Barnes, Frank C., *Cartridges of the World*, U.S. Army .50 BMG Cartridge Specifications, DBI Books (1989), ISBN 0-87349-033-9, p.432
- [25] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), pp. 311–312.
- [26] M903 Caliber .50 Saboted Light Armor Penetrator (SLAP), M962 Saboted Light Armor, GlobalSecurity.org
- [27] Caliber .50 Cartridges, GlobalSecurity.org
- [28] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), p. 225
- [29] George, John B., *Shots Fired In Anger*, NRA Press (1981), p. 404: By World War II, the M2HB had been designated as a dual-purpose anti-aircraft and anti-vehicular weapon for motorized, armored, and infantry divisions; the designation “anti-vehicular” included thin-skinned and lightly armored vehicles, as it was already recognized by 1940 that the .50 M2 AP round would not be useful against modern medium or heavy tanks.
- [30] Bird, James, *Recollections of James R. Bird, A Battery, 160th F.A., 45th Inf. Div.*, Article
- [31] Green, Michael, and Green, Gladys, *Weapons of Patton's Armies*, Zenith Imprint Press (2000), ISBN 0-7603-0821-7, ISBN 978-0-7603-0821-9, p. 34
- [32] Bishop, Chris, *The Encyclopedia of Weapons of World War II*, Sterling Publishing Company, Inc. (2002), ISBN 1-58663-762-2, ISBN 978-1-58663-762-0, p. 86
- [33] Green, Michael, and Green, Gladys, *Weapons of Patton's Armies*, Zenith Imprint Press (2000), ISBN 0-7603-0821-7, ISBN 978-0-7603-0821-9, pp. 32–34
- [34] Yeide, 2004. p. 185
- [35] Burgett, Donald, *Seven Roads To Hell*, Dell Publishing (1999), ISBN 0-440-23627-4, p. 129
- [36] Jarymowycz, Roman J., *Tank Tactics: From Normandy to Lorraine*, Lynne Rienner Publishers (2001), ISBN 1-55587-950-0, ISBN 978-1-55587-950-1, p. 212
- [37] Rush, Robert S., *GI: The US Infantryman in World War II*, Osprey Publishing Ltd. (2003), ISBN 1-84176-739-5, p. 33
- [38] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), pp. 225, 311–312
- [39] Henry, Mark R., *The US Army in World War II (2): The Mediterranean*, Osprey Publishing (2000), ISBN 1-84176-085-4, ISBN 978-1-84176-085-8, p. 20
- [40] Abramski, Anthony V. (Pfc.), *Eyewitness Account of Pfc. Anthony V. Abramski*, Citation In Support Of Congressional Medal of Honor Award to 2nd Lt. Audie Murphy at Holtzwihr, France, 26 January 1945
- [41] Wolfe, Clarence B., *I Kept My Word*, AuthorHouse Press (2006), ISBN 1-4259-6951-8, ISBN 978-1-4259-6951-6, p. 68
- [42] *The United States Army in World War II*, Ch. XXI: Artillery & Armored Units in the ETO, Washington, D.C.: Historical Division, U.S. Army (1993), p. 645
- [43] Jarymowycz, Roman J., *Tank Tactics: From Normandy to Lorraine*, Lynne Rienner Publishers (2001), ISBN 1-55587-950-0, ISBN 978-1-55587-950-1, p. 212: The M2HB fitted to tanks and M3 half-tracks was frequently employed against German rearguard forces including snipers and anti-tank teams, often firing into locations merely suspected of hiding such forces (so-called speculative fire).
- [44] George, John B., *Shots Fired In Anger*, NRA Press (1981), p. 404
- [45] AAA Weapons of the U.S. Army, Part I: The “Quad 50” Machine Gun Mount, 225th AAA Searchlight Battalion (Skylighters) Article
- [46] Schmitt, Eric, *Medal of Honor to Be Awarded to Soldier Killed in Iraq, a First*, New York Times, 30 March 2005
- [47] Rottman, Gordon L., *Browning .50-Caliber Machine Guns*, Osprey Publishing (2010), ISBN 978-1-84908-331-7, p. 19–20
- [48] Shore, C. (Capt.), *With British Snipers to the Reich*, Boulder: Lancer Militaria, p. 197–198
- [49] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), p. 35, 145
- [50] Shore, C. (Capt.), *With British Snipers to the Reich*, Boulder: Lancer Militaria, p. 197–198: They especially liked the “hell’s brew” of AP, API, and APIT ammunition.

- [51] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), p. 153: The New Zealand and South African divisions in particular loved the big Browning, and were frequently encountered trading for spare parts and gauges.
- [52] Kennedy, Michael Paul, *Soldier I: SAS*, London: Bloomsbury Publishing PLC (1990), ISBN 0-7475-0750-3
- [53] "Sniper Rifles". GlobalSecurity. Retrieved 2008-03-24. When a 24-year old Marine sharpshooter named Carlos Norman Hathcock II chalked up the farthest recorded kill in the history of sniping—2,500 yards (1.42 miles, a distance greater than 22 football fields) in February 1967, he fired a Browning M2 .50 Cal. Machine Gun.
- [54] Sgt. Grit (2006). "Marine Corps Sniper Carlos N. Hathcock II". Retrieved 2008-03-24. Viet Cong shot dead by a round fired from a scope-mounted Browning M-2 .50 caliber machine gun at the unbelievable range of 2,500 yards (2,300 m).
- [55] Zumbro, Ralph, *Tank Sergeant*, Presidio Press (1986), p. 92
- [56] New .50 Cal Machine Guns, No Tanks - SAdefensejournal.com, 19 August 2011
- [57] MA DEUCE version M2A1-Proven Performer gets an Upgrade - PEOSoldier.mil, January 3, 2011
- [58] Ma Deuce Still Going Strong - Defenseindustrydaily.com
- [59] Army to convert Browning M2 to M2A1 - Thefirearmblog.com, August 6, 2011
- [60] M2A1 conversion - Strategypage.com, Feb 2, 2012
- [61] M2A1 Among Greatest Army Inventions of 2011 - Thefirearmblog.com, September 21, 2012
- [62] M2A1 Machine Gun Features Greater Safety, Heightened Lethality - Army.mil, November 30, 2012
- [63] Marines unveil plan to modernize their small arms arsenal - MarineCorpsTimes.com, 17 September 2015
- [64] "Aircraft Gunnery .50 Cal.". browningmgs.com. Retrieved March 9, 2013.
- [65] *M296 .50 cal. (12.7 mm) Machine Gun Article*
- [66] *M296 .50 cal. (12.7 mm) Machine Gun*
- [67] 6-6 Cavalry aircrews field new Kiowa Warrior weapons system. US Army.
- [68] Sea Stallions Implement New Ramp Mount Weapon System. USMC
- [69] Jones, Richard D. *Jane's Infantry Weapons 2009/2010*. Jane's Information Group; 35 edition (January 27, 2009). ISBN 978-0-7106-2869-5.
- [70] "Light Calibre Weapons". Adi-limited.com. Retrieved 2008-09-08.
- [71] Report of the Bahrain Independent Commission of Inquiry (PDF) (Report). Bahrain Independent Commission of Inquiry. 23 November 2011.
- [72] "Geværer" . forsvaret.dk (in Danish). Danish Defence. Retrieved 19 October 2014.
- [73] Combat Support Wing (December 2007). "Eskadrille 615 støtter Søværnet" [Squadron 615 aids the Navy] (PDF). *Mjølner* (in Danish): 5.
- [74] "Uudised - Kaitsevägi". Retrieved 25 December 2014.
- [75] "Puolustusvoimat - Pyörremyrsky - Puolustusvoimien sotaharjoitus 2011" (in Finnish). Puolustusvoimat.fi. 2011-05-13. Retrieved 2011-09-19.
- [76] "Die CH-53 als Brücke in die Zukunft" (The CH-53 as a bridge to the future)
- [77] "Army - Defence Forces". Retrieved 25 December 2014.
- [78] "12,7mm ložmetējs Browning M2HB-QCB" (in Latvian).
- [79] "Lietuvos kariuomenė :: Ginkluotė ir karinė technika » Kulkosvaidžiai » Sunkusis 12.7 mm (50) kulkosvaidis M-2 browning" (in Lithuanian). Kariuomene.kam.lt. 2009-12-15. Retrieved 2011-09-19.
- [80] Armement
- [81] "HyperWar: Lend-Lease Shipments, World War II (Ordnance)". Retrieved 25 December 2014.
- [82] <http://www.infodefensa.com/es/2016/01/20/noticia-helicopteros-cougar-chinook-incorporaran-nuevas-ametralladoras-m.html>
- [83] "Kulspruta 88 - Försvarsmakten". Försvarsmakten.se. 2007-08-23. Retrieved 2011-09-19.
- [84] [http://upload.wikimedia.org/wikipedia/commons/thumb/1/1f/Independence\\_Day\\_Parade\\_-\\_Flickr\\_-\\_Kerri-Jo\\_%2861%29.jpg/1024px-Independence\\_Day\\_Parade\\_-\\_Flickr\\_-\\_Kerri-Jo\\_%2861%29.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/1/1f/Independence_Day_Parade_-_Flickr_-_Kerri-Jo_%2861%29.jpg/1024px-Independence_Day_Parade_-_Flickr_-_Kerri-Jo_%2861%29.jpg)
- [85] "Manroy Website". Manroy.co.uk. Retrieved 2008-09-08.
- [86] MOD Defence News report of M3M acquisition for CHC mod.co.uk defence news accessed 26 Sept 2010

## Bibliography

- Chinn, George M. (1951), *The Machine Gun: History, Evolution and Development of Manually Operated, Full Automatic, and Power Driven Aircraft Machine Guns 1*, Department of the Navy, Bureau of Ordnance
- Dunlap, Roy F. (1948), *Ordnance Went Up Front: Some Observations and Experiences of a Sergeant of Ordnance, who served throughout World War II with the United States Army in Egypt, the Philippines and Japan, including way stations*, A Samworth Book on Firearms, Plantersville, SC: Small-Arms Technical Publishing Co., OCLC 6081851
- George, John B. (1981). *Shots Fired In Anger*, NRA Press, ISBN 0-935998-42-X

- Gresham, John D. (December 2001). “Weapons” . *Military Heritage*. Volume 3, No. 3: 22, 24, 26, 28, 30 (John Browning's (M2) .50-caliber).
- Hogg, Ian. (2001). *The American Arsenal*. Ian Hogg, ed. London, UK: Greenhill Books, ISBN 978-1-85367-470-9
- MCWP 3-15.1: Machine Guns and Machine Gun Gunnery USMC (requires client certificate). Alternative via scribd
- Yeide, Harry. (2004). *The Tank Killers*. Havertown, Penn.: Casemate, ISBN 978-1-932033-26-7
- Zaloga, Steven J. (2002). *M8 Greyhound Light Armored Car 1941–91*. Oxford, UK: Osprey Publishing, ISBN 978-1-84176-468-9

### 10.9.9 External links

- Aircraft Gunnery\_.50 cal.
- M2 .50 Caliber Machine Gun at Federation of American Scientists
- Browning M2HB & M2HQCB (USA)
- M2 .50 cal. Machine Gun at Olive-Drab.com
- Quad-50 M2 .50 cal. Machine Gun at Olive-Drab.com
- Browning M2 .50 Caliber Machine Gun at Gary's Olive Drab Page
- Browning M2 HB .50 Caliber Heavy Machine Gun, “Ambush in Mogadishu”, *Frontline*, PBS
- Can you use the .50-caliber on human targets?, *Stars & Stripes*
- Video of Operation on YouTube
- U.S. Army FM 23-65 Browning Machine Gun Caliber .50 HB, M2
- Browning .50 Cal. M2 Aircraft dimensions

## 10.10 M242 Bushmaster

“M242” redirects here. For the Israeli Jeep derivative, see [AIL Storm § Storm II](#).

The **M242 Bushmaster** is a 25 mm (25×137mm) chain-driven autocannon. It is used extensively by the US armed forces, as well as by **NATO**'s and some other nations' forces in ground combat vehicles and watercraft. Originally, the weapon was designed and manufactured by

McDonnell Douglas (later acquired by the Boeing Corporation); however it is now produced by Alliant Techsystems (ATK) of Mesa, Arizona.

It is an externally powered, chain-driven, single-barrel weapon which may be fired in semi-automatic, burst, or automatic modes. It is fed by a metallic link belt and has dual-feed capability. The term “chain gun” derives from the use of a **roller chain** that drives the bolt back and forth. The gun can destroy lightly armored vehicles and aerial targets (such as helicopters and slow-flying aircraft). It can also suppress enemy positions such as exposed troops, dug-in positions, and occupied built-up areas. The standard rate of fire is 200 rounds per minute. The weapon has an effective range of 3,000 metres (9,800 ft), depending on the type of ammunition used. With over 10,000 units sold worldwide it is one of the most successful modern autocannons.

### 10.10.1 History



*The Enhanced M242 on the M2 Bradley (the top-mounted metal box and spotlight are MILES training attachments, not part of the gun system). Note the fluted barrel.*

The Bushmaster project started as an offshoot of the **US Army**'s **MICV-65** program that was attempting to introduce a new **infantry fighting vehicle** to replace their existing **M113s**. Part of this program called for a new scout vehicle to replace the **M114**, a parallel development taking place under the **XM800 Armored Reconnaissance Scout Vehicle**. Both the XM800 and the cavalry version of the XM701 MICV vehicles were armed with the **M139**, a US-built version of the **Hispano-Suiza HS.820** 20 mm autocannon.

During the testing phase, the Army eventually rejected the XM701 and started work on a newer design known as the **XM723**. Soon after the XM800 was also rejected. This led to the combination of the two programs, moving the scout role to the cavalry version of the XM723.

At the same time, the M139 proved to be disappointing and a contract for a new weapon to replace it started in 1972 at **Hughes Aircraft** as the **Vehicle Rapid-Fire Weapons System-Successor**, or **VRFWS-S**. This was essentially a power-driven gun firing similar ammunition

as the HS.820, the power-driven mechanism would ensure operation even in the case of a misfire.

Progress on the VRFWS-S was slow, and eventually resulted in a switch to a much more powerful 25 mm round. Similar delays in the MICV program meant the ultimate vehicles descending from their efforts, the **M2/M3 Bradley Fighting Vehicle**, did not enter production until 1981, by which point the Bushmaster had matured. Since 1990, there have been several enhancements made upon the weapon, resulting in the **Enhanced 25 mm gun**.

To date, more than 10,500 weapons are in service. One of the major reasons for this popularity is the extremely reliable nature of the weapon. It has a rating of 22,000 mean rounds between failure (MRBF), much higher than many comparable devices.

### 10.10.2 Description



*Close up of the MK 38 naval variant*

Unlike most automatic firearms, the M242 does not depend on gas or recoil to actuate its firing system. Instead, it uses a 1 hp (0.75 kW) DC motor, positioned in the receiver to drive the chain and dual-feed system. This system uses sprockets and extractor grooves to feed, load, fire, extract, and eject rounds. A system of clutches provides for an alternate sprocket to engage and thus allows the gunner to switch between **armor-piercing** and **high-explosive** rounds.

The weapon assembly consists of three parts: the barrel assembly, the feeder assembly, and the receiver assembly. The three-part structure makes it possible for a two-person team to install or remove the system (under ideal conditions) despite its considerable total weight.

The M242 weapon system has both electrical and manual fire control and can be operated electrically or manually. In doing so, the gunner can choose from three rates of fire: (1) Single Shot Semi-Automatic, in which the gunner can shoot as fast as the trigger can be operated, limited only by the electrical drive speed (it cannot be fired faster than High rate); (2) Low Rate Fully Automatic, in which the weapon fires 100 rounds a minute, plus or minus 25 rounds; and (3) High Rate Fully Automatic, in

which the weapon fires 200 rounds a minute, plus or minus 25 rounds.

### 10.10.3 Ammunition



*M793 Target Practice with Tracer (TP-T) rounds for the MK-38 being inspected.*



*MK210 High Explosive Incendiary with Tracer (HEI-T)*

A wide range of ammunition has been developed for this weapon, providing it with the capability to defeat the majority of armored vehicles it is likely to encounter, up to and including some tanks. The ammunition used in the M242 may also be used in a variety of weapons such as the **GAU-12 Equalizer**, the **French Giat M811**, or the **Swiss Oerlikon KBA** weapon system. It has the capa-

bility to fire U.S. manufactured ammunition as well as the **NATO** equivalents thereof. Primarily though, it fires six types of rounds: the M791, M792, M793, M910, MK210, and M919.

1. M791 Armour-piercing discarding sabot with Tracer
  - 5.7 million rounds produced
  - The APDS-T penetrates lightly armored vehicles, self-propelled artillery, and aerial targets such as helicopters and various slow-moving, fixed-wing aircraft.
2. M792 High Explosive Incendiary with Tracer and Self Destruct
  - 5.5 million rounds produced
  - The HEI-T can destroy unarmored vehicles and helicopters and suppress antitank missile positions and enemy squads out to a maximum effective range of 2,200 meters.
3. M793 Target Practice with Tracer
  - 11.5 million rounds produced
  - The TP-T cartridge is a fixed-type, percussion-primed training round that matches the High Explosive Incendiary with Tracer (HEI-T M792) round ballistically. The TP-T's tracer is visible out to 2,000 meters, however, the round has a maximum effective range (accuracy-limited) of 1,600 meters.
4. M910 Target Practice Discarding Sabot with Tracer
  - The TPDS-T replicates the flight pattern of the M791 Armor Piercing Discarding Sabot with Tracer (APDS-T) round. The TPDS-T allows units to realistically practice sabot engagements.
5. MK210 High Explosive Incendiary with Tracer
  - 228,000 rounds produced
  - Used by the U. S. Navy in their Mk38 naval weapon system.
6. M919 Armor-Piercing, Fin-Stabilized Discarding Sabot With Tracer.
  - The APFSDS-T round penetrates light armored vehicles, self-propelled artillery, and aerial targets, which includes helicopters and slow-moving fixed-wing aircraft. The dart is made of depleted uranium.

#### 10.10.4 Variations

The M242 is currently in use by the United States Army, Navy, Marine Corps, and Coast Guard, the New Zealand Army, Royal New Zealand Navy, the Norwegian Army, the Spanish Army, the Swiss Army, the Canadian Army, the Australian Army and the Royal Australian Navy, the Israeli Navy, Philippine Navy, the Singapore Army and Republic of Singapore Navy as well as several others. The wide usage results in several variations and modifications on the standard M242 weapon system.

#### Ground Vehicles

The M242 is standard equipment on the U. S. Army M2 and M3 Bradley fighting vehicles, it is also in use on the LAV-25. Before the project was cancelled, the Bushmaster II 30 mm chain gun (a successor to the M242) was used on the Marine Corps' Expeditionary Fighting Vehicle (EFV).

The M242 is also a popular choice of primary armament for armoured fighting vehicles manufactured around the world, such as Singapore's Bionix AFVs and as the Rafael OWS-25 mounted on upgraded M113A2 Ultra IFVs.\* [2]

#### Enhanced 25 mm gun

Work on an upgraded weapon began in 1990. In doing so, all three major systems and seven minor systems were improved. The modifications began with introducing a chrome-lined barrel, an enhanced feeder, and an enhanced receiver. The weapon systems also received minor upgrades such as quick-detachable link covers, a larger breech assembly, a high efficiency muzzle brake, longer recoil, an integral round counter, an extended life firing pin and spring, and a triple-spring drive clutch. It was first put to use on the M2A3 Bradley, the fourth version of the M2 Bradley Fighting Vehicle.

#### Naval

In 1977, the U. S. Navy realized that it needed a replacement for the Oerlikon 20mm Mk 16 series of guns. In 1986, this requirement was satisfied with the introduction of the **Mk 38 Mod 0** weapons system. A derivative of the M242 system, the Mk 38 consists of the M242 chain gun and the **Mk 88 Mod 0** machine gun mount. It provides ships with defensive and offensive gunfire capability for the engagement of a variety of surface targets. Designed primarily as a close-range defensive measure, it provides protection against patrol boats, floating mines, and various shore-based targets.

**Mk 38 Mod 2** See also: Typhoon Weapon System

Recently, several US Navy platforms have been outfitted with a newer version, the Typhoon Weapon System designated **Mk 38 Mod 2**,<sup>\*[3]\*[4]</sup> which is remotely operated and includes an Electronic Optical Sight, Laser Range-Finder, FLIR, and a more reliable feeding system, enhancing the weapon systems capabilities and accuracy. In 2006 the Sri Lanka Navy added the M242 to its fleet of Fast Attack Craft.<sup>\*[5]</sup>

The system is also in use by the Republic of Singapore Navy's *Formidable*-class frigate and *Endurance*-class landing platform dock ship<sup>\*[6]</sup> and were deployed as part of coalition forces' port security efforts in Iraq as well as anti-piracy roles in the Gulf of Aden.<sup>\*[7]</sup> Aside from that, the Singapore Police Coast Guard's New Coastal Patrol Craft (NCPC) has adopted the system as its main armament.<sup>\*[8]</sup>

- Weapons station for the remote controlled M242 on the **HMNZS Canterbury (L421)** multi-role vessel.
- The United States Marine Corps' LAV-25.
- The Mk38. The M242 has a characteristic fluted gun barrel to reduce weight and assist cooling.<sup>\*[1]</sup>
- A Mk 38 MOD 2 25mm machine gun system aboard the amphibious dock landing ship **USS Pearl Harbor** ejecting spent casings.

1. ^ Avila, 1LT(P) EN, USAR, Joel. "The Real Benefits of Barrel Fluting". <http://www.snipercountry.com>. Retrieved 25 August 2014. External link in |website= (help)

BAE and Boeing teamed together after a March 2011 contract to add a directed energy weapon to the Mk 38 Mod 2 gun mount, known as the **Mk 38 Mod 2 tactical laser system**. The TLS combines a Boeing-designed solid-state laser with the existing BAE-manufactured Mk 38 mount to deliver high-precision accuracy against fast surface and air threats including speed boats and unmanned aerial vehicles (UAVs). Laser power levels can be adjusted depending on the target and mission objectives.<sup>\*[9]\*[10]</sup>

**Mk 38 Mod 3** In April 2012, BAE unveiled the **Mk 38 Mod 3** version of the system mount, developed in collaboration with Rafael. It is visually distinctive from previous versions with its stealthy housing, which also protects the gun from weather and allows for easier access to internal components through large access panels. The Mod 3 mounts a larger **Alliant Techsystems Mk44 Bushmaster II** 30 mm cannon for a 500-meter range increase, as well as a coaxial **M2 .50 caliber machine gun**. Elevation is increased to +75 degrees for engaging UAVs and helicopters, and ammunition storage is greater at 420 30 mm rounds. Other features include a larger manual fire

control panel, an offset mode specifically for firing warning shots, and a surveillance mode where the gun can be pointed away from a target but the EO sensor remains pointed in the target direction. Although it has a high degree of commonality and has the same footprint as previous models, the Mod 3 is 20 percent heavier due to greater ammo load.<sup>\*[11]</sup>

### 10.10.5 Operators



Map with M242 operators in blue

#### Current operators

- Australia<sup>\*[12]</sup>
  - Army: ASLAV-25
  - Navy: Armidale class patrol boats, Hobart class destroyers
- Canada
  - Land: Coyote reconnaissance vehicle, LAV III APC
- Israel
  - Navy: Super Dvora Mk III class patrol boat, Shaldag class fast patrol boat
- Malaysia
  - Army: ACV-300 IFV
- New Zealand
  - Army: NZLAV
  - Navy: HMNZS Canterbury multi-role vessel and Protector class offshore patrol vessels
- Norway
- Philippines
  - Army: GKN Simba AIFV
  - Navy: Gregorio del Pilar class frigates, Jacinto class corvette, Mariano Alvarez class coastal patrol vessel, and Jose Andrade class patrol craft

-  Singapore\* [2]\*[6]\*[8]
  - Army: Bionix 25, M113A2 Ultra IFV
  - Navy: Endurance class landing platform dock ship, Formidable-class frigate
-  Spain
  - Army: VEC-M1
  - Navy: BAM
-  Sri Lanka\*[5]
-  Switzerland
-  Turkey
-  United Kingdom
  - Navy: Bay class landing ships
-  United States
  - Army: M2/M3 Bradley
  - Navy (Mk. 38 Mod 0 and Mk. 38 Mod 2): Arleigh Burke-class destroyer, Ticonderoga-class cruiser, Oliver Hazard Perry-class frigate, Wasp-class amphibious assault ship, Tarawa-class amphibious assault ship, Whidbey Island-class dock landing ship, Harpers Ferry-class dock landing ship, Austin-class amphibious transport dock, Blue Ridge class command ship, Cyclone-class patrol ship, Mark VI patrol boat, Small Surface Combatant
  - Marine Corps: LAV-25
  - Coast Guard (Mk. 38 Mod 0): Hamilton-class cutter, Sentinel-class cutter, Island class cutter, USCGC Alex Haley (WMEC-39)

## 10.10.6 See also

- List of artillery
- M230 30 mm automatic cannon
- Bushmaster II 30 mm chain gun
- Bushmaster III 35/50 mm chain gun
- Bushmaster IV 40 mm chain gun
- 30mm DS30M Mark 2 Automated Small Calibre Gun British automated mount with 30mm Bushmaster II
- List of weapons of the United States Marine Corps
- List of crew-served weapons of the U.S. armed forces

## 10.10.7 References

### Notes

- [1] <http://www.atk.com/Products/documents/25mm%20M242%20Bushmaster%20Cannon.pdf>
- [2] “Factsheet - Technical Specifications of Ultra M113” (Press release). Ministry of Defence, Singapore. 16 June 1998 [Last updated on 12 June 2010]. Retrieved 28 October 2010. Check date values in: |date= (help)
- [3] “Mk 38 Mod 2 Machine Gun System (MGS)”. BAE Systems. Retrieved 24 October 2010.
- [4] [http://www.rafael.co.il/marketing/SIP\\_STORAGE/FILES/1/941.pdf](http://www.rafael.co.il/marketing/SIP_STORAGE/FILES/1/941.pdf)
- [5] Sri-Lanka learns to counter Sea Tigers’ swarm tactics, JANE’S NAVY INTERNATIONAL, Jane’s Information Group.
- [6] “RSN - Assets - Weapons”. Ministry of Defence (Singapore) (MINDEF). 23 July 2010. Retrieved 15 September 2010.
- [7] “The Next Wave” . MINDEF. 6 May 2010. Retrieved 15 September 2010.
- [8] Muhammad Juffry, Bin Jojhani (Jul–Aug 2009). “PCG upgrades with new fleet and training centre” . *Police Life Monthly* (Singapore: Singapore Police Force) 35 (7). ISSN 0217-8699. Retrieved 8 November 2010.
- [9] BAE Putting Lasers on Mk 38 Naval Gun - DefenseTech.org, 25 July 2011
- [10] Boeing and BAE team up to develop laser weapon for the U.S. Navy - Gizmag.com, 26 July 2011
- [11] BAE Systems Developing Next Generation Mk 38 Gun Mount - Defensemedianetwork.com, 24 September 2012
- [12] Wertheim, Eric, ed. (2007). *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems* (15th ed.). Annapolis, MD: Naval Institute Press. p. 22. ISBN 978-1-59114-955-2. OCLC 140283156.

## 10.10.8 External links

- Alliant Techsystems (ATK) M242 Bushmaster Automatic Cannon Fact Sheet
- Federation of American Scientists: M242
- NavWeaps.Com: 25 mm/87(1") Mark 38 Machine Gun System
- U. S. Army Field Manual 3-22.1
- Canadian-American Strategic Review: M242

# Chapter 11

## Electronics and Countermeasures

### 11.1 AN/SPS-49

The **AN/SPS-49** is a United States Navy two-dimensional, long range air search radar built by Raytheon that can provide contact bearing and range. It is a primary air-search radar for numerous ships in the U.S. fleet and in Spain, Poland, Taiwan aboard *Oliver Hazard Perry*-class frigates, Canada on its *Halifax*-class frigates, New Zealand on its *Anzac*-class frigates and Australia on its *Adelaide*-class frigates and *Anzac*-class frigates. It also serves in a complementary role aboard Aegis cruisers with the **AN/SPY-1**.

#### 11.1.1 Operation

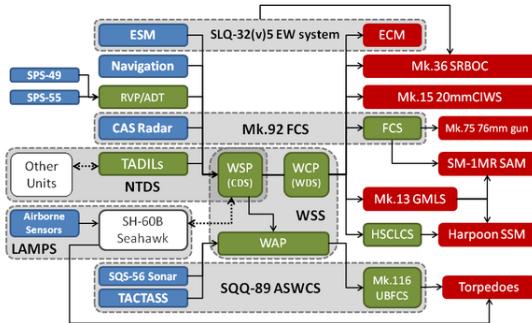
First tested in 1965 aboard *USS Gyatt* (DD-712) and introduced in 1975, the AN/SPS-49 operates in the 851–942 MHz, or L-, band and has a range of 256 nautical miles (474 km). The orange-peel parabolic shape of the antenna creates a narrow 3.3°-beam to reduce the probability of detection or jamming. It can rotate at 6 rpm in long range mode or 12 rpm in short-range mode. <sup>\*[1]</sup> Default is at 12 rpm for the AN/SPS-49A(V)1, to provide more frequent scans against incoming missiles. The SPS-49A(V)1 can detect out to its full range at either 6 or 12 rpm. The antenna is stabilised to compensate for ships pitch and roll, to a maximum of +/−15° for both pitch and roll in 12 rpm mode, and +/−23.5° for both pitch and roll in 6 rpm mode. The output stage of the transmitter in all variants uses a two-cavity **klystron** amplifier.

In 1998, the Inspector General of the Department of Defense reported that **SPS-40** and **SPS-49** radars in Bahrain were “unusable because the equipment operates on a frequency that interferes with the Bahrain telecommunications services” . <sup>\*[2]</sup>

#### 11.1.2 Variants

As of 2014, there are eleven configurations of the AN/SPS-49(V).

- AN/SPS-49(V)1 - Baseline radar (Various CVN, LHA, LSD and other ships)



The **AN/SPS-49** is part of the combat systems of the *Oliver Hazard Perry* class frigate.



Antenna of an AN/SPS-49(V)8 ANZ radar system on a Royal Australian Navy ANZAC class frigate. The AS-177B/UPX antenna fitted to the rear of the reflector functions as a back-fill radiator for the AS-4328/U IFF interrogator antenna.

- AN/SPS-49(V)2 - (V)1 radar without the coherent side lobe cancellation feature (*Oliver Hazard Perry*-class frigates)
- AN/SPS-49(V)3 - (V)1 radar with the radar video processor (RVP) interface (FC-1) (*USS Long Beach* (CGN-9))
- AN/SPS-49(V)4 - (V)2 with the RVP interface (*Oliver Hazard Perry*-class frigates)
- AN/SPS-49(V)5 - (V)1 with automatic target detec-

tion (ATD) (New Threat Upgrade (NTU) ships)

- AN/SPS-49(V)6 - (V)3 system with double shielded cables and a modified cooling system (*USS Ticonderoga (CG-47)*)
- AN/SPS-49(V)7 - (V)5 system with a (V)6 cooling system (*Aegis combat system*)
- AN/SPS-49(V)8 - (V)5 system enhanced to include the AEGIS Tracker modification kit (*Aegis combat system*)
- AN/SPS-49(V)8 ANZ - (V)8 system modified to interface with the CelsiusTech 9LV-453 combat system (*Anzac-class frigates*)
- AN/SPS-49(V)9 - (V)5 with medium PRF upgrade (MPU)
- AN/SPS-49A(V)1 - Developed in the mid-1990s. Added radial speed determination on each target, each scan. Improved clutter rejection

### 11.1.3 See also

- List of radars

### 11.1.4 References

- [1] GlobalSecurity AN/SPS-49
- [2] “Pentagon Equipment Disrupting Phone System” . *Boca Raton News* (Associated Press). October 18, 1998.

### 11.1.5 External links

- Electronics Technician Volume 4-Radar Systems - via Tpub

## 11.2 AN/SPS-55

The **AN/SPS-55** is a solid state surface search and navigation radar. It was developed by Cardion Electronics for the U.S. Navy under a contract awarded in 1971. It was originally developed for a class of ships known as Patrol Frigates, but it was also installed on numerous Cruisers, Destroyers and Minesweepers. It is an **I band** radar and its antenna consists of two waveguide slotted arrays mounted back-to-back. One array provides **linear polarisation** and the other provides **circular polarisation**. Polarisation is user selectable and the circular polarised array is more effective in reducing returns from precipitation.\* [2]

### 11.2.1 Features

- Magnetron transmitter
- Low noise RF receiver
- Sensitivity time control
- Fast time constant filtering
- Sector radiate

The effective range of the radar is from 50 feet to beyond 50 miles. It is primarily used to detect other ships, coastlines and navigation hazards.

The “Sensitivity Time Control” automatically adjusts the gain of the RF receiver from low to high based on the time elapsed from the last transmitter pulse. This helps to adjust for the fact that near by targets generate a larger return than distant targets of the same size.

The “Fast Time Constant Filtering” helps to remove targets which have a very large range size, like clouds, while passing targets with a smaller range size, like ships or aircraft.

The “Sector Radiate” allows the operator to turn off the transmitter for any sized pie shaped sector of the antenna's 360 degree rotation. An operator might want to do this to avoid detection by an enemy receiver which lies within a known or suspected location.

The installation of Field Change 13 disabled the antenna's circular polarisation feature. Field Change 13 was necessary to address reliability issues associated with the replacement version of the waveguide switch used for polarisation selection.

### 11.2.2 Platforms

- **Ticonderoga class cruisers:** AN/SPS-73 has replaced the AN/SPS-55
- **Kidd class destroyers**
- **Spruance class destroyers**
- **Oliver Hazard Perry class frigates**
- **Avenger class countermeasure ship**

### 11.2.3 References

- [1] FAS.org - AN/SPS-55
- [2] Electronics Technician Vol 7 - AN/SPS-55



*AN/SPS-55 antenna on USS Nicholson (DD-982).*

### 11.2.4 External links

- GlobalSecurity.org - AN/SPS-55
- FAS.org - AN/SPS-55
- GlobalSecurity.org: CG-47 Ticonderoga-class
- Electronics Technician Vol 7 - AN/SPS-55
- NAVAIR warfighters encyclopedia - AN/SPS-55

## 11.3 AN/SLQ-25 Nixie



*SLQ-25 Nixie aboard USS Iowa (BB-61)*



*TB-14A towed decoy, from the AN/SLQ-25A/C "Nixie" system*

The **AN/SLQ-25 Nixie** and its variants are towed torpedo decoys used on US and allied warships. It consists of a towed decoy device (TB-14A) and a shipboard signal generator. The decoy emits signals to draw a torpedo away from its intended target.

The Nixie attempts to defeat a torpedo's passive sonar by emitting simulated ship noise, such as propeller and engine noise, which is more attractive than the ship to the torpedo's sensors.

The AN/SLQ-25A Nixie is a clean-sheet design when compared to the AN/SLQ-25 Nixie. Apart from a few minor mechanical components, they share no common parts. The AN/SLQ-25A utilises a fiber optic tow cable (FOTC) and a 10 horsepower RL-272C double drum winch. Several engineering changes resulted in COTS equipment being utilised extensively in the system. A diagnostic program can be initiated locally or from the remote control station, and tests all electronic functions.

The AN/SLQ-25B includes equipment of the AN/SLQ-25A and incorporates a towed array sensor to detect submarines and incoming torpedoes. The AN/SLQ-25B also incorporates additional active sonar decoys by receiving, amplifying, and returning "pings" from the torpedo, presenting a larger false target to the torpedo.

The AN/SLQ-25C System is an upgrade to the AN/SLQ-25A system. The AN/SLQ-25C incorporates improved surface ship torpedo countermeasures with the addition of new countermeasure modes along a longer, more functional Tow Cable.

Typically, larger ships may have two Nixie systems mounted on the rear of the ship to allow operation singularly or in pairs while smaller ships may have only one system.

Under a joint UK/ US Memorandum of understanding, the UK MoD and the US DoD are furthering torpedo survivability systems. The US is currently working on an Active Source program called the DCL Technology Demonstrator programme and the UK has developed and entered into service the S2170 Surface Ship Torpedo Defence system.

### 11.3.1 External links

- <https://fas.org/man/dod-101/sys/ship/weaps/an-slq-25.htm>
- <http://www.janes.com/extracts/extract/juws/juws0325.html>

## 11.4 AN/SLQ-32 Electronic Warfare Suite

The **AN/SLQ-32** is a shipboard electronic warfare suite built by the Raytheon Company of Goleta, California. It is currently the primary electronic warfare system in use by U.S. Navy ships (as of 2007).



The AN/SLQ-32(V)3 antenna aboard USS Nicholson (DD-982).



The AN/SLQ-32(V)1 antenna aboard USS Bowen (FF-1079).

### 11.4.1 Variants

Referred to by its operators as the “slick-32”. The SLQ-32 was originally conceived in the 1970s to augment the AN/WLR-1, which had been in service since the early 1960s. It was later determined to save costs to replace the various WLR-1 series suites with the SLQ-32 as a stand alone system. As originally designed, the SLQ-32 was produced in three variants, the (V)1, (V)2 and (V)3. Later in its service life, two additional versions were built, the (V)4 and (V)5. The Air Transport Rack sized processors were supplied by ROLM Mil-Spec Computers in San Jose, CA.

- **SLQ-32(V)1** – A simple threat warning receiver, it was capable of receiving high-band radar signals of the type commonly carried on missiles and aircraft. The (V)1 was installed on auxiliary ships and small combatants such as frigates. This variant of the system is being phased out as current ships equipped become decommissioned.
- **SLQ-32(V)2** – Initially the most common variant, the (V)2 added the ability to receive surveillance and targeting radars. This provided a passive targeting capability for Harpoon missile-equipped ships. The (V)2 was installed on frigates, destroyers, and 270-foot (82 m) Coast Guard Cutters.
- **SLQ-32(V)3** – Expanding on the (V)2’s capabilities, the (V)3 added active radar-jamming capabil-

ity. The (V)3 was installed on various combatants such as cruisers, battleships, large amphibious ships and high-value replenishment vessels.

- **SLQ-32(V)4** – Designed for installation on aircraft carriers, the (V)4 consisted of two (V)3 systems, one for each side of the ship, tied to a common computer and display console. Additional line replaceable units and software were added to support the wide separation of the two antenna/electronics enclosures.

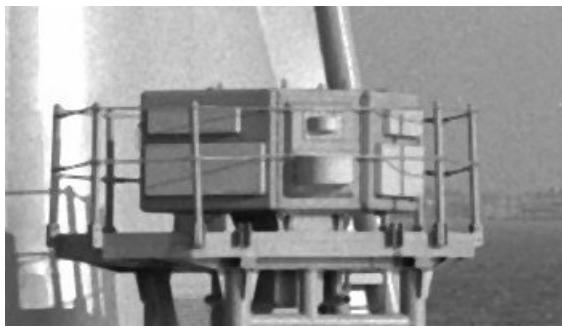


Sidekick jamming antenna on USS Ford (FFG-54) part of (V)5.

- **SLQ-32(V)5** – The (V)5 was built as a response to the Stark incident in 1987. The (V)5 incorporated a compact version of the (V)3 system intended to give active jamming capability to the Perry class FFG’s, which were too small to carry a full (V)3.

All versions of the SLQ-32, with the exception of the (V)4, are interfaced with the MK36 Decoy Launching System, able to launch chaff and infrared decoys under the control of the SLQ-32. The number and arrangement of MK36 launchers installed depends on the size of the ship, ranging from two launchers on a small combatant to as many as ten on an aircraft carrier. A growing number of systems are being upgraded to incorporate the multi-national MK-53 Nulka system.

The original modular design was intended to allow upgrades of the system from one variant to the next by sim-



The AN/SLQ-32(V)2 antenna aboard USS Donald B. Beary (FF-1085).

ply installing additional equipment as required. Starting in the early 1990s, a program was begun to upgrade all SLQ-32s in the U.S. fleet. Most (V)1 systems were upgraded to (V)2, and most (V)2 systems were upgraded to (V)3. This was normally carried out during a major ship overhaul.

#### 11.4.2 Contract



AN/SLQ-32 console aboard USS Blue Ridge (LCC 19).

The initial procurement process was built around a “design to price” concept in which the final delivery cost per system was fixed in the contract. The SLQ-32 was designed to support the protection of ships against anti-ship missiles in an open sea environment. After initial deployment of the system, naval roles began to change requiring ships to operate much closer to shore in denser signal environments. This change in roles required changes to the SLQ-32 systems which were added over time. With experience gained working with the SLQ-32, coupled with improvements to the hardware and software, technicians and operators gradually overcame the initial problems. The SLQ-32 is now the mainstay of surface electronic warfare in the U.S. Navy and U.S. Coast Guard's WMEC 270-foot (82 m) Class Ships.

#### 11.4.3 Future

In 1996, a program called the *Advanced Integrated Electronic Warfare System* (AIEWS) was begun to develop a replacement for the SLQ-32. Designated the AN/SLY-2, AIEWS reached the prototype stage by 1999, but funding was withdrawn in April 2002 due to ballooning costs and constant delays in the projects development. It has since been replaced with *Surface Electronic Warfare Improvement Program* (SEWIP), which will replace the existing SLQ-32 hardware and technology in an evolutionary fashion. As of September 2013 SEWIP Block 2 upgrades were first installed on Burke-class destroyers in 2014, with full-rate production scheduled for mid-2015.\* [1] Block 2 improved detection capabilities; better jamming is planned from 2017, but the 2013 sequestration cuts may push this date back a year.\* [2]

SEWIP Block 3 was tested on USS *Freedom* in December 2014.\* [3]

#### 11.4.4 See also

- Electronic Warfare
- ELINT
- U.S. Navy
- Raytheon

#### 11.4.5 References

- [1] “CNO’s Position Report: 2014” (pdf). US Navy. 4 November 2014. Retrieved 2014-11-26.
- [2] Greenert, Admiral Jonathan (18 September 2013). “Statement Before The House Armed Services Committee On Planning For Sequestration In FY 2014 And Perspectives Of The Military Services On The Strategic Choices And Management Review” (pdf). US House of Representatives. Retrieved 21 September 2013.
- [3] “U.S. Navy Evaluates Electronic Warfare Improvement Program for Littoral Combat Ships”. [www.navyrecognition.com](http://www.navyrecognition.com) (Navyrecognition.com). 23 November 2014. Retrieved 24 November 2014.

#### 11.4.6 External links

- Federation of American Scientists: AN/SLQ-32 Electronic Warfare (EW) system
- Raytheon Product Description for the AN/SLQ-32
- AN/SLQ-32 in the *Warfighters Encyclopedia*
- AN/SLQ-32(V)5 Data Sheet
- EXHIBIT R-2, RDT&E Budget Item Justification
- Surface Electronic Warfare Improvement Program (SEWIP)

## 11.5 Mark 36 SRBOC



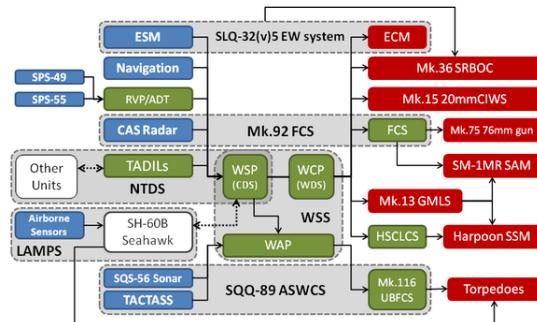
Two Mark 36 Mod 7 Super Rapid Bloom Off-board Chaff (SRBOC) system launchers aboard the battleship *USS Wisconsin* (BB-64) during Operation Desert Storm.

The **BAE Systems Mark 36 Super Rapid Bloom Off-board Countermeasures Chaff and Decoy Launching System** (abbreviated as **SRBOC** or “Super-arboc”) is a short-range mortar that launches chaff or infrared decoys from **naval** vessels to foil **anti-ship** missiles. Each launcher has three tubes set at a 45-degree angle, and three tubes set at a 60 degree angle, providing an effective spread of decoys and countermeasures to defeat radio frequency emitting missiles. The SRBOC can also be fitted with the TORCH infrared “flare” decoy system. A typical ship's load is 20 to 35 rounds per launcher.

As of 2010, the Mk. 36 SRBOC is used by 19 navies around the world. It is similar to the NATO Sea Gnat system.

### 11.5.1 External links

- Federation of American Scientists page
- SRBOC Factsheet



*The SRBOC is part of the combat systems of the Oliver Hazard Perry class frigate.*



*United States Navy Fire Controlman (FC), USN rating badge.*

## 11.6 Fire-control radar

A **fire-control radar (FCR)** is a radar that is designed specifically to provide information (mainly target azimuth, elevation, range and velocity) to a **fire-control system** in order to calculate a firing solution (i.e., information on how to direct weapons such that they hit the target(s)). A typical radar emits a **narrow**, intense beam of **radio waves** to ensure accurate tracking information and to minimize the chance of losing track of the target. Some modern radars have a **track-while-scan** capability, enabling them to function simultaneously as both fire-control radar and **search radar**. This works either by having the radar switch between sweeping the search sector and sending directed pulses at the target to be tracked, or by using a **phased-array** antenna to generate multiple simultaneous radar beams that both search and track.

### 11.6.1 Operational phases

Fire-control radars operate in three different phases:<sup>\*[1]</sup>

**Designation or vectoring phase** The fire-control radar must be directed to the general location of the target due to the radar’s narrow beam width. This phase ends when **lock-on** is acquired.

**Acquisition phase** The fire-control radar switches to the acquisition phase of operation once the radar is in

the general vicinity of the target. During this phase, the radar system searches in the designated area in a predetermined search pattern until the target is located or redesignated. This phase terminates when a weapon is launched.

**Tracking phase** The fire-control radar enters into the track phase when the target is located. The radar system locks onto the target during this phase. This phase ends when the target is destroyed.

## 11.6.2 Performance

The performance of a fire-control radar is determined primarily by two factors: radar resolution and atmospheric conditions. Radar resolution is the ability of the radar to differentiate between two targets closely located. The first, and most problematic, is gaining high-range resolution. To do this in a basic fire-control radar system, it must operate at smaller pulse width. Bearing resolution is typically ensured by using a narrow (one or two degree) beam width. Atmospheric conditions, such as moisture lapse, temperature inversion, and dust particles affect radar performance as well. Moisture lapse and temperature inversion often cause ducting, in which RF energy is bent as it passes through hot and cold layers. This can either extend or reduce the [radar horizon](#), depending on which way the RF is bent. Dust particles, as well as water droplets, cause attenuation of the RF energy, resulting in a loss of effective range. In both cases, a lower pulse repetition frequency makes the radar less susceptible to atmospheric conditions.

## 11.6.3 Countermeasures

Most fire-control radars have unique characteristics, such as radio frequency, pulse duration, pulse frequency and power. These can assist in identifying the radar, and therefore the weapon system it is controlling. This can provide valuable tactical information, like the maximum range of the weapon, or flaws that can be exploited, to combatants that are listening for these signs. During the [cold war](#) Soviet fire control radars were often named and NATO pilots would be able to identify the threats present by the radar signals they received.

## 11.6.4 Surface based

One of the first successful fire-control radars, the [SCR-584](#), was used effectively and extensively by the Allies during [World War II](#) for anti-aircraft gun laying. Since WWII, the U.S. Army has used radar for directing anti-aircraft missiles including the [MIM-23 Hawk](#), the [Nike](#) series and currently the [MIM-104 Patriot](#).

## 11.6.5 Ship based

Examples of fire-control radars currently in use by the United States Navy:

- Mk 95 —Continuous Wave Illuminator (NATO Sea sparrow Surface Missile System)
- Mk 92 —Combined Antenna System (Mk 75 Gun, formerly [SM-1](#) missiles)
- AN/SPG-62 —Continuous Wave Illuminator (AEGIS)
- AN/SPQ-9B —Pulse Doppler ([Mk 45](#) lightweight gun)

## 11.6.6 Aircraft based

After WWII, airborne fire control radars have evolved from the simpler gun and rocket laying AN/APG-36 system used in the [F-86D](#) to the [Active electronically scanned array](#) based AN/APG-81 of the F-35.

## 11.6.7 See also

- Radar configurations and types
- List of radars
- List of military electronics of the United States

## 11.6.8 References

[1] Donald J. Povejsil (1965). *Airborne Radar*. Boston Technical Publishers. p. 101. Retrieved 2009-02-10.

- US Navy, FIRE CONTROLMAN, VOLUME 02 —FIRE CONTROL RADAR FUNDAMENTALS (Revised)

## 11.6.9 External links

- AN/APG Fire Control Systems at [GlobalSecurity.org](#)

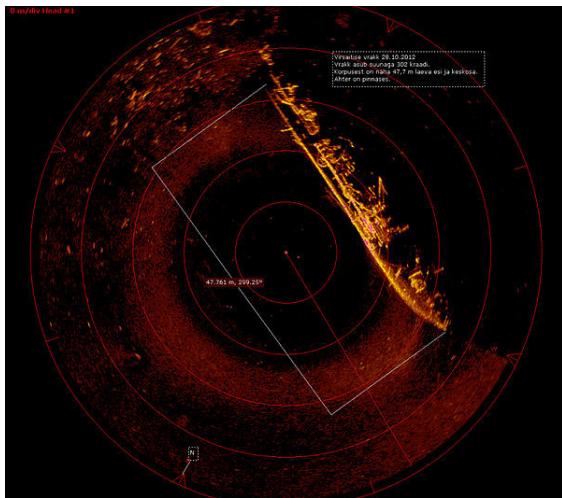
## 11.7 Sonar

This article is about underwater sound propagation. For atmospheric sounding, see [SODAR](#). For the Zeiss lens, see [Sonnar](#). For other uses, see [Sonar \(disambiguation\)](#).

**Sonar** (originally an acronym for **SOund Navigation And Ranging**) is a technique that uses sound propagation (usually underwater, as in submarine navigation) to navigate,



French F70 type frigates (here, La Motte-Picquet) are fitted with VDS (Variable Depth Sonar) type DUBV43 or DUBV43C towed sonars



Sonar image of shipwreck of the Latvian Naval Forces ship Virsaitis in Estonian waters.

communicate with or detect objects on or under the surface of the water, such as other vessels. Two types of technology share the name “sonar”: *passive* sonar is essentially listening for the sound made by vessels; *active* sonar is emitting pulses of sounds and listening for echoes. Sonar may be used as a means of **acoustic location** and of measurement of the echo characteristics of “targets” in the water. Acoustic location in air was used before the introduction of **radar**. Sonar may also be used in air for robot navigation, and **SODAR** (an upward looking in-air sonar) is used for atmospheric investigations. The term **sonar** is also used for the equipment used to generate and receive the sound. The acoustic frequencies used in sonar systems vary from very low (**infrasonic**) to extremely high (**ultrasonic**). The study of underwater sound is known as **underwater acoustics** or **hydroacoustics**.

### 11.7.1 History

Although some animals (dolphins and bats) have used sound for communication and object detection for millions of years, use by humans in the water is initially recorded by Leonardo da Vinci in 1490: a tube inserted into the water was said to be used to detect vessels by placing an ear to the tube.\* [1]

In the 19th century an underwater bell was used as an ancillary to lighthouses to provide warning of hazards.

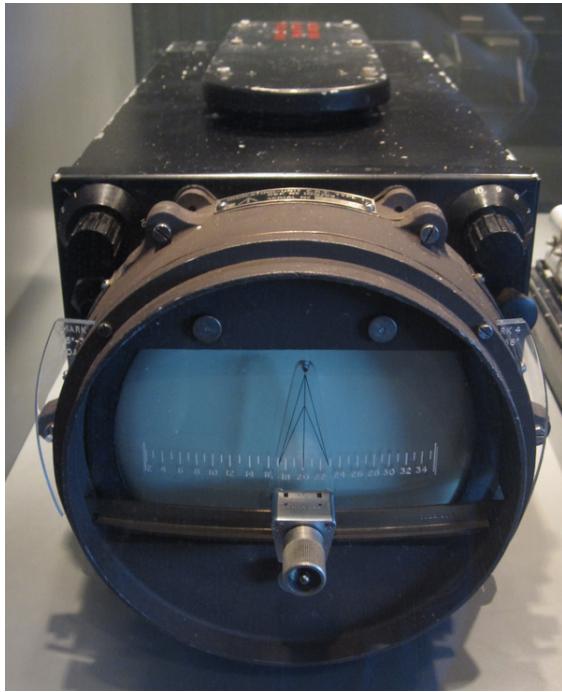
The use of sound to ‘echo locate’ underwater in the same way as **bats** use sound for aerial navigation seems to have been prompted by the *Titanic* disaster of 1912. The world’s first patent for an underwater echo ranging device was filed at the British Patent Office by English meteorologist **Lewis Richardson** a month after the sinking of the *Titanic*,\* [2] and a German physicist **Alexander Behm** obtained a patent for an echo sounder in 1913.

The Canadian engineer **Reginald Fessenden**, while working for the Submarine Signal Company in Boston, built an experimental system beginning in 1912, a system later tested in Boston Harbor, and finally in 1914 from the U.S. Revenue (now Coast Guard) Cutter Miami on the **Grand Banks** off Newfoundland Canada.\* [2]\* [3] In that test, Fessenden demonstrated depth sounding, underwater communications (Morse code) and echo ranging (detecting an iceberg at two miles (3 km) range).\* [4]\* [5] The so-called **Fessenden oscillator**, at ca. 500 Hz frequency, was unable to determine the bearing of the berg due to the 3 metre wavelength and the small dimension of the transducer’s radiating face (less than 1 metre in diameter). The ten **Montreal**-built British H class submarines launched in 1915 were equipped with a Fessenden oscillator.\* [6]

During **World War I** the need to detect submarines prompted more research into the use of sound. The British made early use of underwater listening devices called hydrophones, while the French physicist **Paul Langevin**, working with a Russian immigrant electrical engineer, **Constantin Chilowsky**, worked on the development of active sound devices for detecting submarines in 1915. Although **piezoelectric** and **magnetostrictive** transducers later superseded the **electrostatic** transducers they used, this work influenced future designs. Lightweight sound-sensitive plastic film and fibre optics have been used for **hydrophones** (acousto-electric transducers for in-water use), while **Terfenol-D** and **PMN** (lead magnesium niobate) have been developed for projectors.

### ASDIC

In 1916, under the British Board of Invention and Research, Canadian physicist **Robert William Boyle** took on the active sound detection project with **A B Wood**, producing a prototype for testing in mid-1917. This work, for the Anti-Submarine Division of the British



ASDIC display unit ca. 1944

Naval Staff, was undertaken in utmost secrecy, and used quartz piezoelectric crystals to produce the world's first practical underwater active sound detection apparatus. To maintain secrecy no mention of sound experimentation or quartz was made - the word used to describe the early work ('supersonics') was changed to 'ASD'ics, and the quartz material to 'ASD'ivite: "ASD" for "Anti-Submarine Division", hence the British acronym *ASDIC*. In 1939, in response to a question from the *Oxford English Dictionary*, the Admiralty made up the story that it stood for 'Allied Submarine Detection Investigation Committee', and this is still widely believed,<sup>\*[7]</sup> though no committee bearing this name has been found in the Admiralty archives.<sup>\*[8]</sup>

By 1918, both France and Britain had built prototype active systems. The British tested their ASDIC on *HMS Antrim* in 1920, and started production in 1922. The 6th Destroyer Flotilla had ASDIC-equipped vessels in 1923. An anti-submarine school, *HMS Osprey*, and a training flotilla of four vessels were established on Portland in 1924. The US Sonar QB set arrived in 1931.

By the outbreak of World War II, the Royal Navy had five sets for different surface ship classes, and others for submarines, incorporated into a complete anti-submarine attack system. The effectiveness of early ASDIC was hamstrung by the use of the depth charge as an anti-submarine weapon. This required an attacking vessel to pass over a submerged contact before dropping charges over the stern, resulting in a loss of ASDIC contact in the moments leading up to attack. The hunter was effectively firing blind, during which time a submarine commander could take evasive action. This situation was remedied

by using several ships cooperating and by the adoption of "ahead throwing weapons", such as Hedgehog and later Squid, which projected warheads at a target ahead of the attacker and thus still in ASDIC contact. Developments during the war resulted in British ASDIC sets which used several different shapes of beam, continuously covering blind spots. Later, acoustic torpedoes were used.

At the start of World War II, British ASDIC technology was transferred for free to the United States. Research on ASDIC and underwater sound was expanded in the UK and in the US. Many new types of military sound detection were developed. These included sonobuoys, first developed by the British in 1944 under the codename *High Tea*, dipping/dunking sonar and mine detection sonar. This work formed the basis for post war developments related to countering the nuclear submarine. Work on sonar had also been carried out in the Axis countries, notably in Germany, which included countermeasures. At the end of World War II this German work was assimilated by Britain and the US. Sonars have continued to be developed by many countries, including Russia, for both military and civil uses. In recent years the major military development has been the increasing interest in low frequency active systems.

## SONAR

During the 1930s American engineers developed their own underwater sound detection technology and important discoveries were made, such as thermoclines, that would help future development.<sup>\*[9]</sup> After technical information was exchanged between the two countries during the Second World War, Americans began to use the term SONAR for their systems, coined as the equivalent of the British-invented RADAR.

## Materials and designs

There was little progress in development from 1915 to 1940. In 1940, the US sonars typically consisted of a magnetostrictive transducer and an array of nickel tubes connected to a 1-foot-diameter steel plate attached back to back to a Rochelle salt crystal in a spherical housing. This assembly penetrated the ship hull and was manually rotated to the desired angle. The piezoelectric Rochelle salt crystal had better parameters, but the magnetostrictive unit was much more reliable. Early WW2 losses prompted rapid research in the field, pursuing both improvements in magnetostrictive transducer parameters and Rochelle salt reliability. Ammonium dihydrogen phosphate (ADP), a superior alternative, was found as a replacement for Rochelle salt; the first application was a replacement of the 24 kHz Rochelle salt transducers. Within nine months, Rochelle salt was obsolete. The ADP manufacturing facility grew from few dozen personnel in early 1940 to several thousands in 1942.

One of the earliest application of ADP crystals were hydrophones for acoustic mines; the crystals were specified for low frequency cutoff at 5 Hz, withstanding mechanical shock for deployment from aircraft from 10,000 ft, and ability to survive neighbouring mine explosions. One of key features of ADP reliability is its zero aging characteristics; the crystal keeps its parameters even over prolonged storage.

Another application was for acoustic homing torpedoes. Two pairs of directional hydrophones were mounted on the torpedo nose, in the horizontal and vertical plane; the difference signals from the pairs were used to steer the torpedo left-right and up-down. A countermeasure was developed: the targeted submarine discharged an effervescent chemical, and the torpedo went after the noisier fizzy decoy. The counter-countermeasure was a torpedo with active sonar – a transducer was added to the torpedo nose, and the microphones were listening for its reflected periodic tone bursts. The transducers comprised identical rectangular crystal plates arranged to diamond-shaped areas in staggered rows.

Passive sonar arrays for submarines were developed from ADP crystals. Several crystal assemblies were arranged in a steel tube, vacuum-filled with castor oil, and sealed. The tubes then were mounted in parallel arrays.

The standard US Navy scanning sonar at the end of the World War II operated at 18 kHz, using an array of ADP crystals. Desired longer range however required use of lower frequencies. The required dimensions were too big for ADP crystals, so in the early 1950s magnetostrictive and barium titanate piezoelectric systems were developed, but these had problems achieving uniform impedance characteristics and the beam pattern suffered. Barium titanate was then replaced with more stable lead zirconate titanate (PZT), and the frequency was lowered to 5 kHz. The US fleet used this material in the AN/SQS-23 sonar for several decades. The SQS-23 sonar first used magnetostrictive nickel transducers, but these weighed several tons and nickel was expensive and considered a critical material; piezoelectric transducers were therefore substituted. The sonar was a large array of 432 individual transducers. At first the transducers were unreliable, showing mechanical and electrical failures and deteriorating soon after installation; they were also produced by several vendors, had different designs, and their characteristics were different enough to impair the array's performance. The policy to allow repair of individual transducers was then sacrificed, and “expendable modular design”, sealed non-repairable modules, was chosen instead, eliminating the problem with seals and other extraneous mechanical parts.\*[10]

The Imperial Japanese Navy at the onset of WW2 used projectors based on quartz. These were big and heavy, especially if designed for lower frequencies; the one for Type 91 set, operating at 9 kHz, had a diameter of 30 inches and was driven by an oscillator with 5 kW power

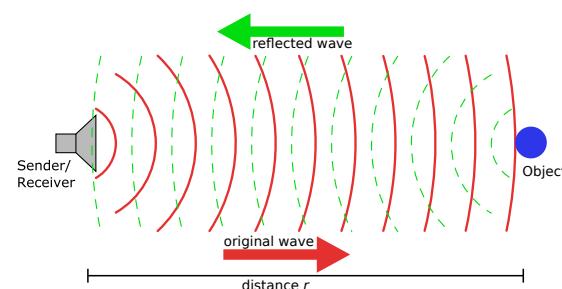
and 7 kV of output amplitude. The Type 93 projectors consisted of solid sandwiches of quartz, assembled into spherical cast iron bodies. The Type 93 sonars were later replaced with Type 3, which followed German design and used magnetostrictive projectors; the projectors consisted of two rectangular identical independent units in a cast iron rectangular body about 16×9 inches. The exposed area was half the wavelength wide and three wavelengths high. The magnetostrictive cores were made from 4 mm stampings of nickel, and later of an iron-aluminium alloy with aluminium content between 12.7 and 12.9%. The power was provided from a 2 kW at 3.8 kV, with polarization from a 20 V/8 A DC source.

The passive hydrophones of the Imperial Japanese Navy were based on moving coil design, Rochelle salt piezo transducers, and carbon microphones.\*[11]

Magnetostrictive transducers were pursued after WW2 as an alternative to piezoelectric ones. Nickel scroll-wound ring transducers were used for high-power low-frequency operations, with size up to 13 feet in diameter, probably the largest individual sonar transducers ever. The advantage of metals is their high tensile strength and low input electrical impedance, but they have electrical losses and lower coupling coefficient than PZT, whose tensile strength can be increased by prestressing. Other materials were also tried; nonmetallic ferrites were promising for their low electrical conductivity resulting in low eddy current losses, Metglas offered high coupling coefficient, but they were inferior to PZT overall. In the 1970s, compounds of rare earths and iron were discovered with superior magnetomechanic properties, namely the Terfenol-D alloy. This made possible new designs, e.g. a hybrid magnetostrictive-piezoelectric transducer. The most recent sch material is Galfenol.

Other types of transducers include variable reluctance (or moving armature, or electromagnetic) transducers, where magnetic force acts on the surfaces of gaps, and moving coil (or electrodynamic) transducers, similar to conventional speakers; the latter are used in underwater sound calibration, due to their very low resonance frequencies and flat broadband characteristics above them.\*[12]

### 11.7.2 Active sonar



Principle of an active sonar

Active sonar uses a sound transmitter and a receiver. When the two are in the same place it is monostatic operation. When the transmitter and receiver are separated it is bistatic operation. When more transmitters (or more receivers) are used, again spatially separated, it is multistatic operation. Most sonars are used monostatically with the same array often being used for transmission and reception. Active sonobuoy fields may be operated multistatically.

Active sonar creates a pulse of sound, often called a "ping", and then listens for reflections (echo) of the pulse. This pulse of sound is generally created electronically using a sonar projector consisting of a signal generator, power amplifier and electro-acoustic transducer/array. A beamformer is usually employed to concentrate the acoustic power into a beam, which may be swept to cover the required search angles. Generally, the electro-acoustic transducers are of the Tonpilz type and their design may be optimised to achieve maximum efficiency over the widest bandwidth, in order to optimise performance of the overall system. Occasionally, the acoustic pulse may be created by other means, e.g. (1) chemically using explosives, or (2) airguns or (3) plasma sound sources.

To measure the distance to an object, the time from transmission of a pulse to reception is measured and converted into a range by knowing the speed of sound. To measure the bearing, several hydrophones are used, and the set measures the relative arrival time to each, or with an array of hydrophones, by measuring the relative amplitude in beams formed through a process called beamforming. Use of an array reduces the spatial response so that to provide wide cover multibeam systems are used. The target signal (if present) together with noise is then passed through various forms of signal processing, which for simple sonars may be just energy measurement. It is then presented to some form of decision device that calls the output either the required signal or noise. This decision device may be an operator with headphones or a display, or in more sophisticated sonars this function may be carried out by software. Further processes may be carried out to classify the target and localise it, as well as measuring its velocity.

The pulse may be at constant frequency or a chirp of changing frequency (to allow pulse compression on reception). Simple sonars generally use the former with a filter wide enough to cover possible Doppler changes due to target movement, while more complex ones generally include the latter technique. Since digital processing became available pulse compression has usually been implemented using digital correlation techniques. Military sonars often have multiple beams to provide all-round cover while simple ones only cover a narrow arc, although the beam may be rotated, relatively slowly, by mechanical scanning.

Particularly when single frequency transmissions are

used, the Doppler effect can be used to measure the radial speed of a target. The difference in frequency between the transmitted and received signal is measured and converted into a velocity. Since Doppler shifts can be introduced by either receiver or target motion, allowance has to be made for the radial speed of the searching platform.

One useful small sonar is similar in appearance to a waterproof flashlight. The head is pointed into the water, a button is pressed, and the device displays the distance to the target. Another variant is a "fishfinder" that shows a small display with shoals of fish. Some civilian sonars (which are not designed for stealth) approach active military sonars in capability, with quite exotic three-dimensional displays of the area near the boat.

When active sonar is used to measure the distance from the transducer to the bottom, it is known as echo sounding. Similar methods may be used looking upward for wave measurement.

Active sonar is also used to measure distance through water between two sonar transducers or a combination of a hydrophone (underwater acoustic microphone) and projector (underwater acoustic speaker). A transducer is a device that can transmit and receive acoustic signals ("pings"). When a hydrophone/transducer receives a specific interrogation signal it responds by transmitting a specific reply signal. To measure distance, one transducer/projector transmits an interrogation signal and measures the time between this transmission and the receipt of the other transducer/hydrophone reply. The time difference, scaled by the speed of sound through water and divided by two, is the distance between the two platforms. This technique, when used with multiple transducers/hydrophones/projectors, can calculate the relative positions of static and moving objects in water.

In combat situations, an active pulse can be detected by an opponent and will reveal a submarine's position.

A very directional, but low-efficiency, type of sonar (used by fisheries, military, and for port security) makes use of a complex nonlinear feature of water known as non-linear sonar, the virtual transducer being known as a *parametric array*.

## Project Artemis

Project Artemis was a one-of-a-kind low-frequency sonar for surveillance that was deployed off Bermuda for several years in the early 1960s. The active portion was deployed from a World War II tanker, and the receiving array was a built into a fixed position on an offshore bank.

## Transponder

This is an active sonar device that receives a stimulus and immediately (or with a delay) retransmits the received signal or a predetermined one.

### Performance prediction

A sonar target is small relative to the sphere, centred around the emitter, on which it is located. Therefore, the power of the reflected signal is very low, several orders of magnitude less than the original signal. Even if the reflected signal was of the same power, the following example (using hypothetical values) shows the problem: Suppose a sonar system is capable of emitting a 10,000 W/m<sup>2</sup> signal at 1 m, and detecting a 0.001 W/m<sup>2</sup> signal. At 100 m the signal will be 1 W/m<sup>2</sup> (due to the inverse-square law). If the entire signal is reflected from a 10 m<sup>2</sup> target, it will be at 0.001 W/m<sup>2</sup> when it reaches the emitter, i.e. just detectable. However, the original signal will remain above 0.001 W/m<sup>2</sup> until 300 m. Any 10 m<sup>2</sup> target between 100 and 300 m using a similar or better system would be able to detect the pulse but would not be detected by the emitter. The detectors must be very sensitive to pick up the echoes. Since the original signal is much more powerful, it can be detected many times further than twice the range of the sonar (as in the example).

In active sonar there are two performance limitations, due to noise and reverberation. In general one or other of these will dominate so that the two effects can be initially considered separately.

In noise limited conditions at initial detection:

$$\text{SL} - 2\text{TL} + \text{TS} - (\text{NL} - \text{DI}) = \text{DT}$$

where SL is the source level, TL is the transmission loss (or propagation loss), TS is the target strength, NL is the noise level, DI is the directivity index of the array (an approximation to the array gain) and DT is the detection threshold.

In reverberation limited conditions at initial detection (neglecting array gain):

$$\text{SL} - 2\text{TL} + \text{TS} = \text{RL} + \text{DT}$$

where RL is the reverberation level and the other factors are as before.

### Hand-held sonar for use by a diver

- The LIMIS (= Limpet Mine Imaging Sonar) is a hand-held or ROV-mounted imaging sonar for use by a diver. Its name is because it was designed for patrol divers (combat frogmen or Clearance Divers) to look for limpet mines in low visibility waterities
- The LUIS (= Lensing Underwater Imaging System) is another imaging sonar for use by a diver.
- There is or was a small flashlight-shaped handheld sonar for divers, that merely displays range.
- For the INSS = Integrated Navigation Sonar System

### 11.7.3 Passive sonar

Passive sonar listens without transmitting. It is often employed in military settings, although it is also used in science applications, e.g., detecting fish for presence/absence studies in various aquatic environments - see also passive acoustics and passive radar. In the very broadest usage, this term can encompass virtually any analytical technique involving remotely generated sound, though it is usually restricted to techniques applied in an aquatic environment.

#### Identifying sound sources

Passive sonar has a wide variety of techniques for identifying the source of a detected sound. For example, U.S. vessels usually operate 60 Hz alternating current power systems. If transformers or generators are mounted without proper vibration insulation from the hull or become flooded, the 60 Hz sound from the windings can be emitted from the submarine or ship. This can help to identify its nationality, as all European submarines and nearly every other nation's submarine have 50 Hz power systems. Intermittent sound sources (such as a wrench being dropped) may also be detectable to passive sonar. Until fairly recently, an experienced, trained operator identified signals, but now computers may do this.

Passive sonar systems may have large sonic databases, but the sonar operator usually finally classifies the signals manually. A computer system frequently uses these databases to identify classes of ships, actions (i.e. the speed of a ship, or the type of weapon released), and even particular ships. Publications for classification of sounds are provided by and continually updated by the US Office of Naval Intelligence.

#### Noise limitations

Passive sonar on vehicles is usually severely limited because of noise generated by the vehicle. For this reason, many submarines operate nuclear reactors that can be cooled without pumps, using silent convection, or fuel cells or batteries, which can also run silently. Vehicles' propellers are also designed and precisely machined to emit minimal noise. High-speed propellers often create tiny bubbles in the water, and this cavitation has a distinct sound.

The sonar hydrophones may be towed behind the ship or submarine in order to reduce the effect of noise generated by the watercraft itself. Towed units also combat the thermocline, as the unit may be towed above or below the thermocline.

The display of most passive sonars used to be a two-dimensional waterfall display. The horizontal direction of the display is bearing. The vertical is frequency, or sometimes time. Another display technique is to color-

code frequency-time information for bearing. More recent displays are generated by the computers, and mimic radar-type plan position indicator displays.

### Performance prediction

Unlike active sonar, only one way propagation is involved. Because of the different signal processing used, the minimum detectable signal to noise ratio will be different. The equation for determining the performance of a passive sonar is:

$$SL - TL = NL - DI + DT$$

where SL is the source level, TL is the transmission loss, NL is the noise level, DI is the directivity index of the array (an approximation to the array gain) and DT is the detection threshold. The figure of merit of a passive sonar is:

$$FOM = SL + DI - (NL + DT).$$

### 11.7.4 Performance factors

The detection, classification and localisation performance of a sonar depends on the environment and the receiving equipment, as well as the transmitting equipment in an active sonar or the target radiated noise in a passive sonar.

#### Sound propagation

Sonar operation is affected by variations in sound speed, particularly in the vertical plane. Sound travels more slowly in **fresh water** than in **sea water**, though the difference is small. The speed is determined by the water's **bulk modulus** and **mass density**. The bulk modulus is affected by temperature, dissolved impurities (usually **salinity**), and pressure. The density effect is small. The speed of sound (in feet per second) is approximately:

$$4388 + (11.25 \times \text{temperature (in } ^\circ\text{F)}) + (0.0182 \times \text{depth (in feet)}) + \text{salinity (in parts-per-thousand)}.$$

This **empirically** derived approximation equation is reasonably accurate for normal temperatures, concentrations of salinity and the range of most ocean depths. Ocean temperature varies with depth, but at between 30 and 100 meters there is often a marked change, called the **thermocline**, dividing the warmer surface water from the cold, still waters that make up the rest of the ocean. This can frustrate sonar, because a sound originating on one side of the thermocline tends to be bent, or refracted, through the thermocline. The thermocline may be present

in shallower coastal waters. However, wave action will often mix the water column and eliminate the thermocline. Water **pressure** also affects sound propagation: higher pressure increases the sound speed, which causes the sound waves to refract away from the area of higher sound speed. The mathematical model of refraction is called **Snell's law**.

If the sound source is deep and the conditions are right, propagation may occur in the '**deep sound channel**'. This provides extremely low propagation loss to a receiver in the channel. This is because of sound trapping in the channel with no losses at the boundaries. Similar propagation can occur in the '**surface duct**' under suitable conditions. However, in this case there are reflection losses at the surface.

In shallow water propagation is generally by repeated reflection at the surface and bottom, where considerable losses can occur.

Sound propagation is affected by **absorption** in the water itself as well as at the surface and bottom. This absorption depends upon frequency, with several different mechanisms in sea water. Long-range sonar uses low frequencies to minimise absorption effects.

The sea contains many sources of noise that interfere with the desired target echo or signature. The main noise sources are **waves** and **shipping**. The motion of the receiver through the water can also cause speed-dependent low frequency noise.

#### Scattering

When active sonar is used, **scattering** occurs from small objects in the sea as well as from the bottom and surface. This can be a major source of interference. This acoustic scattering is analogous to the scattering of the light from a car's headlights in fog: a high-intensity pencil beam will penetrate the fog to some extent, but broader-beam headlights emit much light in unwanted directions, much of which is scattered back to the observer, overwhelming that reflected from the target ( "white-out" ). For analogous reasons active sonar needs to transmit in a narrow beam to minimise scattering.

#### Target characteristics

The sound **reflection** characteristics of the target of an active sonar, such as a submarine, are known as its **target strength**. A complication is that echoes are also obtained from other objects in the sea such as whales, wakes, schools of fish and rocks.

Passive sonar detects the target's **radiated** noise characteristics. The radiated **spectrum** comprises a **continuous spectrum** of noise with peaks at certain frequencies which can be used for classification.

## Countermeasures

*Active* (powered) countermeasures may be launched by a submarine under attack to raise the noise level, provide a large false target, and obscure the signature of the submarine itself.

*Passive* (i.e., non-powered) countermeasures include:

- Mounting noise-generating devices on isolating devices.
- Sound-absorbent coatings on the hulls of submarines, for example anechoic tiles.

### 11.7.5 Military applications

Modern naval warfare makes extensive use of both passive and active sonar from water-borne vessels, aircraft and fixed installations. Although active sonar was used by surface craft in **World War II**, submarines avoided the use of active sonar due to the potential for revealing their presence and position to enemy forces. However, the advent of modern signal-processing enabled the use of passive sonar as a primary means for search and detection operations. In 1987 a division of Japanese company Toshiba reportedly sold machinery to the Soviet Union that allowed their submarine propeller blades to be milled so that they became radically quieter, making the newer generation of submarines more difficult to detect.

The use of active sonar by a submarine to determine bearing is extremely rare and will not necessarily give high quality bearing or range information to the submarine's fire control team. However, use of active sonar on surface ships is very common and is used by submarines when the tactical situation dictates it is more important to determine the position of a hostile submarine than conceal their own position. With surface ships, it might be assumed that the threat is already tracking the ship with satellite data as any vessel around the emitting sonar will detect the emission. Having heard the signal, it is easy to identify the sonar equipment used (usually with its frequency) and its position (with the sound wave's energy). Active sonar is similar to radar in that, while it allows detection of targets at a certain range, it also enables the emitter to be detected at a far greater range, which is undesirable.

Since active sonar reveals the presence and position of the operator, and does not allow exact classification of targets, it is used by fast (planes, helicopters) and by noisy platforms (most surface ships) but rarely by submarines. When active sonar is used by surface ships or submarines, it is typically activated very briefly at intermittent periods to minimize the risk of detection. Consequently, active sonar is normally considered a backup to passive sonar. In aircraft, active sonar is used in the form of disposable sonobuoys that are dropped in the aircraft's patrol area or in the vicinity of possible enemy sonar contacts.

Passive sonar has several advantages, most importantly that it is silent. If the target radiated noise level is high enough, it can have a greater range than active sonar, and allows the target to be identified. Since any motorized object makes some noise, it may in principle be detected, depending on the level of noise emitted and the ambient noise level in the area, as well as the technology used. To simplify, passive sonar "sees" around the ship using it. On a submarine, nose-mounted passive sonar detects in directions of about  $270^\circ$ , centered on the ship's alignment, the hull-mounted array of about  $160^\circ$  on each side, and the towed array of a full  $360^\circ$ . The invisible areas are due to the ship's own interference. Once a signal is detected in a certain direction (which means that something makes sound in that direction, this is called broadband detection) it is possible to zoom in and analyze the signal received (narrowband analysis). This is generally done using a Fourier transform to show the different frequencies making up the sound. Since every engine makes a specific sound, it is straightforward to identify the object. Databases of unique engine sounds are part of what is known as *acoustic intelligence* or ACINT.

Another use of passive sonar is to determine the target's trajectory. This process is called **Target Motion Analysis** (TMA), and the resultant "solution" is the target's range, course, and speed. TMA is done by marking from which direction the sound comes at different times, and comparing the motion with that of the operator's own ship. Changes in relative motion are analyzed using standard geometrical techniques along with some assumptions about limiting cases.

Passive sonar is stealthy and very useful. However, it requires high-tech electronic components and is costly. It is generally deployed on expensive ships in the form of arrays to enhance detection. Surface ships use it to good effect; it is even better used by submarines, and it is also used by airplanes and helicopters, mostly to a "surprise effect", since submarines can hide under thermal layers. If a submarine's commander believes he is alone, he may bring his boat closer to the surface and be easier to detect, or go deeper and faster, and thus make more sound.

Examples of sonar applications in military use are given below. Many of the civil uses given in the following section may also be applicable to naval use.

## Anti-submarine warfare

Until recently, ship sonars were usually with hull mounted arrays, either amidships or at the bow. It was soon found after their initial use that a means of reducing flow noise was required. The first were made of canvas on a framework, then steel ones were used. Now domes are usually made of reinforced plastic or pressurized rubber. Such sonars are primarily active in operation. An example of a conventional hull mounted sonar is the **SQS-56**.

Because of the problems of ship noise, towed sonars are



*Variable Depth Sonar and its winch*

also used. These also have the advantage of being able to be placed deeper in the water. However, there are limitations on their use in shallow water. These are called towed arrays (linear) or variable depth sonars (VDS) with 2/3D arrays. A problem is that the winches required to deploy/recover these are large and expensive. VDS sets are primarily active in operation while towed arrays are passive.

An example of a modern active/passive ship towed sonar is Sonar 2087 made by Thales Underwater Systems.

## Torpedoes

Modern torpedoes are generally fitted with an active/passive sonar. This may be used to home directly on the target, but wake following torpedoes are also used. An early example of an acoustic homing was the [Mark 37](#) torpedo.

Torpedo countermeasures can be towed or free. An early example was the German *Sieglinde* device while the *Bold*

was a chemical device. A widely used US device was the towed [AN/SLQ-25 Nixie](#) while [Mobile submarine simulator \(MOSS\)](#) was a free device. A modern alternative to the Nixie system is the [UK Royal Navy S2170 Surface Ship Torpedo Defence](#) system.

## Mines

Mines may be fitted with a sonar to detect, localize and recognize the required target. Further information is given in [acoustic mine](#) and an example is the [CAPTOR](#) mine.

## Mine countermeasures

Mine Countermeasure (MCM) Sonar, sometimes called "Mine and Obstacle Avoidance Sonar (MOAS)", is a specialized type of sonar used for detecting small objects. Most MCM sonars are hull mounted but a few types are VDS design. An example of a hull mounted MCM sonar is the Type 2193 while the [SQQ-32 Mine-hunting sonar](#) and Type 2093 systems are VDS designs. See also [Minesweeper \(ship\)](#)

## Submarine navigation

Main article: [Submarine navigation](#)

Submarines rely on sonar to a greater extent than surface ships as they cannot use radar at depth. The sonar arrays may be hull mounted or towed. Information fitted on typical fits is given in [Oyashio class submarine](#) and [Swiftsure class submarine](#).

## Aircraft

Helicopters can be used for antisubmarine warfare by deploying fields of active/pассиве sonobuoys or can operate dipping sonar, such as the [AQS-13](#). Fixed wing aircraft can also deploy sonobuoys and have greater endurance and capacity to deploy them. Processing from the sonobuoys or [Dipping Sonar](#) can be on the aircraft or on ship. Dipping sonar has the advantage of being deployable to depths appropriate to daily conditions. Helicopters have also been used for mine countermeasure missions using towed sonars such as the [AQS-20A](#).

## Underwater communications

Dedicated sonars can be fitted to ships and submarines for underwater communication. See also the section on the [underwater acoustics](#) page.



*AN/AQS-13 Dipping sonar deployed from an H-3 Sea King.*

### Ocean surveillance

For many years, the United States operated a large set of passive sonar arrays at various points in the world's oceans, collectively called **Sound Surveillance System (SOSUS)** and later **Integrated Undersea Surveillance System (IUSS)**. A similar system is believed to have been operated by the Soviet Union. As permanently mounted arrays in the deep ocean were utilised, they were in very quiet conditions so long ranges could be achieved. Signal processing was carried out using powerful computers ashore. With the ending of the Cold War a SOSUS array has been turned over to scientific use.

In the United States Navy, a special badge known as the **Integrated Undersea Surveillance System Badge** is awarded to those who have been trained and qualified in its operation.

### Underwater security

Sonar can be used to detect **frogmen** and other scuba divers. This can be applicable around ships or at entrances to ports. Active sonar can also be used as a deterrent and/or disablement mechanism. One such device is the **Cerberus** system.

See **Underwater Port Security System** and **Anti-frogman techniques#Ultrasound detection**.

### Hand-held sonar

Limpet Mine Imaging Sonar (LIMIS) is a hand-held or ROV-mounted imaging sonar designed for patrol divers (combat **frogmen** or clearance divers) to look for **limpet mines** in low visibility water.

The LUIS is another imaging sonar for use by a diver.

Integrated Navigation Sonar System (INSS) is a small flashlight-shaped handheld sonar for divers that displays range. [13][14]

### Intercept sonar

This is a sonar designed to detect and locate the transmissions from hostile active sonars. An example of this is the Type 2082 fitted on the British **Vanguard** class submarines.

## 11.7.6 Civilian applications

### Fisheries

Fishing is an important industry that is seeing growing demand, but world catch tonnage is falling as a result of serious resource problems. The industry faces a future of continuing worldwide consolidation until a point of **sustainability** can be reached. However, the consolidation of the fishing fleets are driving increased demands for sophisticated fish finding electronics such as sensors, sounders and sonars. Historically, fishermen have used many different techniques to find and harvest fish. However, acoustic technology has been one of the most important driving forces behind the development of the modern commercial fisheries.

Sound waves travel differently through fish than through water because a fish's air-filled **swim bladder** has a different density than seawater. This density difference allows the detection of schools of fish by using reflected sound. Acoustic technology is especially well suited for underwater applications since sound travels farther and faster underwater than in air. Today, commercial fishing vessels rely almost completely on acoustic sonar and sounders to detect fish. Fishermen also use active sonar and echo sounder technology to determine water depth, bottom contour, and bottom composition.

Companies such as eSonar, Raymarine UK, Marport Canada, Wesmar, Furuno, Krupp, and Simrad make a variety of sonar and acoustic instruments for the **deep sea** commercial fishing industry. For example, net sensors take various underwater measurements and transmit the information back to a receiver on board a vessel. Each sensor is equipped with one or more acoustic transducers depending on its specific function. Data is transmitted from the sensors using wireless acoustic telemetry and is received by a hull mounted hydrophone. The **analog signals** are decoded and converted by a digital acoustic receiver into data which is transmitted to a bridge computer for **graphical display** on a high resolution monitor.

### Echo sounding

Main article: **Echo sounding**

Echo sounding is a process used to determine the depth of water beneath **ships** and **boats**. A type of active sonar, echo sounding is the transmission of an acoustic pulse directly downwards to the seabed, measuring the



Cabin display of a fish finder sonar

time between transmission and echo return, after having hit the bottom and bouncing back to its ship of origin. The acoustic pulse is emitted by a transducer which receives the return echo as well. The depth measurement is calculated by multiplying the speed of sound in water(averaging 1,500 meters per second) by the time between emission and echo return.\*[15]\*[16]

The value of underwater acoustics to the fishing industry has led to the development of other acoustic instruments that operate in a similar fashion to echo-sounders but, because their function is slightly different from the initial model of the echo-sounder, have been given different terms.

### Net location

The net sounder is an echo sounder with a transducer mounted on the headline of the net rather than on the bottom of the vessel. Nevertheless, to accommodate the distance from the transducer to the display unit, which is much greater than in a normal echo-sounder, several refinements have to be made. Two main types are available. The first is the cable type in which the signals are sent along a cable. In this case there has to be the provision of a cable drum on which to haul, shoot and stow the cable during the different phases of the operation. The second type is the cable less net-sounder – such as Marport's

Trawl Explorer - in which the signals are sent acoustically between the net and hull mounted receiver/hydrophone on the vessel. In this case no cable drum is required but sophisticated electronics are needed at the transducer and receiver.

The display on a net sounder shows the distance of the net from the bottom (or the surface), rather than the depth of water as with the echo-sounder's hull-mounted transducer. Fixed to the headline of the net, the footrope can usually be seen which gives an indication of the net performance. Any fish passing into the net can also be seen, allowing fine adjustments to be made to catch the most fish possible. In other fisheries, where the amount of fish in the net is important, catch sensor transducers are mounted at various positions on the cod-end of the net. As the cod-end fills up these catch sensor transducers are triggered one by one and this information is transmitted acoustically to display monitors on the bridge of the vessel. The skipper can then decide when to haul the net.

Modern versions of the net sounder, using multiple element transducers, function more like a sonar than an echo sounder and show slices of the area in front of the net and not merely the vertical view that the initial net sounders used.

The sonar is an echo-sounder with a directional capability that can show fish or other objects around the vessel.

### ROV and UUV

Small sonars have been fitted to Remotely Operated Vehicles (ROV) and Unmanned Underwater Vehicles (UUV) to allow their operation in murky conditions. These sonars are used for looking ahead of the vehicle. The Long-Term Mine Reconnaissance System is an UUV for MCM purposes.

### Vehicle location

Sonars which act as beacons are fitted to aircraft to allow their location in the event of a crash in the sea. Short and Long Baseline sonars may be used for carrying out the location, such as LBL.

### Prosthesis for the visually impaired

In 2013 an inventor in the United States unveiled a "spider-sense" bodysuit, equipped with ultrasonic sensors and haptic feedback systems, which alerts the wearer of incoming threats; allowing them to respond to attackers even when blindfolded.\*[17]

### 11.7.7 Scientific applications

### Biomass estimation

Main article: Bioacoustics

Detection of fish, and other marine and aquatic life, and estimation their individual sizes or total biomass using active sonar techniques. As the sound pulse travels through water it encounters objects that are of different density or acoustic characteristics than the surrounding medium, such as fish, that reflect sound back toward the sound source. These echoes provide information on fish size, location, abundance and behavior. Data is usually processed and analysed using a variety of software such as Echoview. See Also: Hydroacoustics and Fisheries Acoustics.

### Wave measurement

An upward looking echo sounder mounted on the bottom or on a platform may be used to make measurements of wave height and period. From this statistics of the surface conditions at a location can be derived.

### Water velocity measurement

Special short range sonars have been developed to allow measurements of water velocity.

### Bottom type assessment

Sonars have been developed that can be used to characterise the sea bottom into, for example, mud, sand, and gravel. Relatively simple sonars such as echo sounders can be promoted to seafloor classification systems via add-on modules, converting echo parameters into sediment type. Different algorithms exist, but they are all based on changes in the energy or shape of the reflected sounder pings. Advanced substrate classification analysis can be achieved using calibrated (scientific) echosounders and parametric or fuzzy-logic analysis of the acoustic data (See: [Acoustic Seabed Classification](#))

### Bathymetric mapping

Side-scan sonars can be used to derive maps of seafloor topography (bathymetry) by moving the sonar across it just above the bottom. Low frequency sonars such as [GLORIA](#) have been used for continental shelf wide surveys while high frequency sonars are used for more detailed surveys of smaller areas.

### Sub-bottom profiling

Powerful low frequency echo-sounders have been developed for providing profiles of the upper layers of the

ocean bottom.

### Synthetic aperture sonar

Various synthetic aperture sonars have been built in the laboratory and some have entered use in mine-hunting and search systems. An explanation of their operation is given in [synthetic aperture sonar](#).

### Parametric sonar

Parametric sources use the non-linearity of water to generate the difference frequency between two high frequencies. A virtual end-fire array is formed. Such a projector has advantages of broad bandwidth, narrow beamwidth, and when fully developed and carefully measured it has no obvious sidelobes: see [Parametric array](#). Its major disadvantage is very low efficiency of only a few percent.\*[18] P.J. Westervelt's seminal 1963 JASA paper summarizes the trends involved.

### Sonar in extraterrestrial contexts

Use of sonar has been proposed for determining the depth of hydrocarbon seas on [Titan](#).\*[19]

## 11.7.8 Effect of sonar on marine life

### Effect on marine mammals



A [Humpback whale](#)

Further information: [Marine mammals and sonar](#)

Research has shown that use of active sonar can lead to mass strandings of [marine mammals](#).\*[20]\*[21] Beaked whales, the most common casualty of the strandings, have been shown to be highly sensitive to mid-frequency active sonar.\*[22] Other marine mammals such as the [blue whale](#) also flee away from the source of the sonar,\*[23] while naval activity was suggested to be the most probable cause of a mass stranding of dolphins.\*[24] The US

Navy, which part-funded some of studies, said the findings only showed behavioural responses to sonar, not actual harm, but “will evaluate the effectiveness of [their] marine mammal protective measures in light of new research findings.” \*[20]

Some marine animals, such as **whales** and **dolphins**, use echolocation systems, sometimes called *biosonar* to locate predators and prey. It is conjectured that active sonar transmitters could confuse these animals and interfere with basic biological functions such as feeding and mating.

### Effect on fish

High intensity sonar sounds can create a small temporary shift in the hearing threshold of some fish.\*[25]\*[26]\*[lower-alpha 1]

### 11.7.9 Frequencies and resolutions

The frequencies of sonars range from infrasonic to above a megahertz. Generally, the lower frequencies have longer range, while the higher frequencies offer better resolution, and smaller size for a given directionality.

To achieve reasonable directionality, frequencies below 1 kHz generally require large size, usually achieved as towed arrays.\*[27]

Low frequency sonars are loosely defined as 1–5 kHz, albeit some navies regard 5–7 kHz also as low frequency. Medium frequency is defined as 5–15 kHz. Another style of division considers low frequency to be under 1 kHz, and medium frequency at between 1–10 kHz.\*[27]

American World War II era sonars operated at a relatively high frequency of 20–30 kHz, to achieve directionality with reasonably small transducers, with typical maximum operational range of 2500 yd. Postwar sonars used lower frequencies to achieve longer range; e.g. SQS-4 operated at 10 kHz with range up to 5000 yd. SQS-26 and SQS-53 operated at 3 kHz with range up to 20,000 yd; their domes had size of approx. a 60-ft personnel boat, an upper size limit for conventional hull sonars. Achieving larger sizes by conformal sonar array spread over the hull has not been effective so far, for lower frequencies linear or towed arrays are therefore used.\*[27]

Japanese WW2 sonars operated at a range of frequencies. The Type 91, with 30 inch quartz projector, worked at 9 kHz. The Type 93, with smaller quartz projectors, operated at 17.5 kHz (model 5 at 16 or 19 kHz magnetostrictive) at powers between 1.7 and 2.5 kilowatts, with range of up to 6 km. The later Type 3, with German-design magnetostrictive transducers, operated at 13, 14.5, 16, or 20 kHz (by model), using twin transducers (except model 1 which had three single ones), at 0.2 to 2.5 kilowatts. The Simple type used 14.5 kHz magnetostrictive transducers at 0.25 kW, driven by capacitive discharge instead

of oscillators, with range up to 2.5 km.\*[11]

The sonar's resolution is angular; objects further apart will be imaged with lower resolutions than nearby ones.

Another source lists ranges and resolutions vs frequencies for sidescan sonars. 30 kHz provides low resolution with range of 1000–6000 m, 100 kHz gives medium resolution at 500–1000 m, 300 kHz gives high resolution at 150–500 m, and 600 kHz gives high resolution at 75–150 m. Longer range sonars are more adversely affected by nonhomogeneities of water. Some environments, typically shallow waters near the coasts, have complicated terrain with many features; higher frequencies become necessary there.\*[28]

As a specific example, the Sonar 2094 Digital, a towed fish capable of reaching depth of 1000 or 2000 meters, performs side-scanning at 114 kHz (600m range at each side, 50 by 1 degree beamwidth) and 410 kHz (150m range, 40 by 0.3 degree beamwidth), with 3 kW pulse power.\*[29]

A JW Fishers system offers side-scanning at 1200 kHz with very high spatial resolution, optionally coupled with longer-range 600 kHz (range 200 ft at each side) or 100 kHz (up to 2000 ft per side, suitable for scanning large areas for big targets).\*[30]

### 11.7.10 See also

- Acoustic Doppler Current Profiler
- Acoustic tag
- Baffles (submarine)
- Beached whale
- Bistatic sonar
- Diver Detection Sonar
- Echo sounding
- Fish finder
- Lead zirconate titanate or PZT, a piezoelectric material used for ultrasonic transducers
- Ocean acoustic tomography
- Passive Radar
- Radar
- Scientific Echosounder
- Side-scan sonar
- SOFAR channel
- Submarine navigation
- Synthetic aperture sonar

- Tonpilz
- Towed array sonar
- Underwater acoustics
- Upward looking sonar

### 11.7.11 Notes

[1] Halvorsen et al. (2013) conclude that observed effects were “typically small even though the fish were near the sonar and remained there for the full duration of three test signals” .

### 11.7.12 References

- [1] Fahy, Frank (1998). *Fundamentals of noise and vibration*. John Gerard Walker. Taylor & Francis. p. 375. ISBN 0-419-24180-9.
- [2] Hill, M. N. (1962). *Physical Oceanography*. Allan R. Robinson. Harvard University Press. p. 498.
- [3] Seitz, Frederick (1999). *The cosmic inventor: Reginald Aubrey Fessenden (1866-1932)* **89**. American Philosophical Society. pp. 41–46. ISBN 0-87169-896-X.
- [4] Hendrick, Burton J. (August 1914). “Wireless Under The Water: A Remarkable Device That Enables A Ship's Captain To Determine The Exact Location Of Another Ship Even In The Densest Fog”. *The World's Work: A History of Our Time* **XLIV** (2): 431–434. Retrieved 2009-08-04.
- [5] “Report of Captain J.H. Quinan of the U.S.R.C Miami on the Echo Fringe Method of Detecting Icebergs and Taking Continuous Soundings”. *Hydrographic Office Bulletin* (U.S. Coast and Geodetic Survey). 1914-05-13. (quoted in a NOAA transcript by Central Library staff April, 2002).
- [6] “The Rotary Bowcap” .
- [7] “World War II Naval Dictionary”. USS Abbot (DD-629). Retrieved February 19, 2014.
- [8] W Hackmann, Seek & Strike: Sonar, anti-submarine warfare and the Royal Navy 1914-54 (HMSO, London, 1984)
- [9] “Howeth: Chapter XXXIX (1963)”.
- [10] [http://www.massa.com/wp-content/uploads/Frank\\_Massa-Sonar\\_Transducers-A\\_History.pdf](http://www.massa.com/wp-content/uploads/Frank_Massa-Sonar_Transducers-A_History.pdf)
- [11] [http://www.fischer-tropsch.org/primary\\_documents/gvt\\_reports/USNAVY/USNTMJ%20Reports/USNTMJ-200B-0343-0412%20Report%20E-10.pdf](http://www.fischer-tropsch.org/primary_documents/gvt_reports/USNAVY/USNTMJ%20Reports/USNTMJ-200B-0343-0412%20Report%20E-10.pdf)
- [12] “Transducers and Arrays for Underwater Sound” .
- [13] Lent, K (2002). “Very High Resolution Imaging Diver Held Sonar”. *Report to the Office of Naval Research*. Retrieved 2008-08-11.
- [14] Krueger, Kenneth L. (2003-05-05). “Diver Charting and Graphical Display” . Texas Univ at Austin Applied Research Labs. Retrieved 2009-01-21.
- [15] “Fathometer” .
- [16] “NOAA Ocean Explorer: Echo Sounding Reading” .
- [17] “This Suit Gives You A Real Life Spider-Sense”. *Forbes*. 23 February 2013. Retrieved 12 March 2013.
- [18] H O Berklay, Some Finite Amplitude Effects in Underwater Acoustics in V M Albers “Underwater Acoustics” 1967
- [19] Arvelo & Lorenz (2013), J Acoust Soc Am
- [20] Damian Carrington (3 July 2013). “Whales flee from military sonar leading to mass strandings, research shows” . *The Guardian*.
- [21] Padraic Flanagan (4 May 2013). “Navy sonar 'did cause mass dolphin deaths' say scientists who blame war games exercise off Cornish coast for strandings”. *The Daily Mail*.
- [22] Stacy L. DeRuiter, Brandon L. Southall, John Calambokidis, Walter M. X. Zimmer, Dinara Sadykova1, Erin A. Falcone, Ari S. Friedlaender, John E. Joseph, David Moretti, Gregory S. Schorr, Len Thomas1 and Peter L. Tyack (2013). “First direct measurements of behavioural responses by Cuvier's beaked whales to mid-frequency active sonar” . *Biology Letters* **9** (4): 20130223. doi:10.1098/rsbl.2013.0223. PMID 23825085.
- [23] Goldbogen JA, Southall BL, Deruiter SL, Calambokidis J, Friedlaender AS, Hazen EL, Falcone EA, Schorr GS, Douglas A, Moretti DJ, Kyburg C, McKenna MF, Tyack PL. (Jul 3, 2013). “Blue whales respond to simulated mid-frequency military sonar” . *Proceedings of the Royal Society B* **280** (765): 20130657. doi:10.1098/rspb.2013.0657. PMID 23825206.
- [24] Jepson PD, Deaville R, Acevedo-Whitehouse K, Barnett J, Brownlow A, Brownell RL Jr, Clare FC, Davison N, Law RJ, Loveridge J, Macgregor SK, Morris S, Murphy S, Penrose R, Perkins MW, Pinn E, Seibel H, Siebert U, Sierra E, Simpson V, Tasker ML, Tregenza N, Cunningham AA, Fernández A. (Apr 30, 2013). “What caused the UK's largest common dolphin (*Delphinus delphis*) mass stranding event?”. *PLoS ONE* **8** (4): e60953. Bibcode:2013PLoS...860953J. doi:10.1371/journal.pone.0060953. PMC 3640001. PMID 23646103.
- [25] Popper, A. N., Halvorsen, M. B., Kane, A., Miller, D. L., Smith, M. E., Song, J., ... & Wysocki, L. E. (2007). The effects of high-intensity, low-frequency active sonar on rainbow trout. *The Journal of the Acoustical Society of America*, 122(1), 623-635.
- [26] Halvorsen, M. B., Zeddies, D. G., Chicoine, D., & Popper, A. N. (2013). Effects of low-frequency naval sonar exposure on three species of fish. *The Journal of the Acoustical Society of America*, 134(2), EL205-EL210.
- [27] “The Naval Institute Guide to World Naval Weapons Systems, 1997-1998” .
- [28] “Ships from the Depths” .

- [29] [http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/99DBBE721D20AD5FC125775A002A2E60/\protect\xunadd\\_text\\_character:nN{\textdollar}{\\\$}file/GeoAcoustics-2094-digital-data-sheet.pdf?OpenElement](http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/99DBBE721D20AD5FC125775A002A2E60/\protect\xunadd_text_character:nN{\textdollar}{\$}file/GeoAcoustics-2094-digital-data-sheet.pdf?OpenElement)
- [30] “JW Fishers - High Frequency Side Scan Sonar” .

### 11.7.15 External links

- Sonar Tutorial for Robots
- Sonars and the marine environment by Norwegian Defence Research Establishment (FFI)
- Single Beam Sonars

### 11.7.13 Bibliography

- Hackmann, Willem. *Seek & Strike: Sonar, anti-submarine warfare and the Royal Navy 1914-54*. London: Her Majesty's Stationery Office, 1984. ISBN 0-11-290423-8
- Hackmann, Willem D. “Sonar Research and Naval Warfare 1914–1954: A Case Study of a Twentieth-Century Science”. *Historical Studies in the Physical and Biological Sciences* 16#1 (1986) 83–110.
- Urick, R. J. *Principles of Underwater Sound*, 3rd edition. (Peninsula Publishing, Los Altos, 1983).

#### Fisheries Acoustics References

- Fisheries Acoustics Research (FAR) at the University of Washington <http://www.acoustics.washington.edu/>
- NOAA Protocols for Fisheries Acoustics Surveys [http://www.st.nmfs.gov/st4/protocol/Acoustic\\_protocols.pdf](http://www.st.nmfs.gov/st4/protocol/Acoustic_protocols.pdf)
- *Acoustics Unpacked*—A “how to” great reference for freshwater hydroacoustics for resource assessment
- “ACOUSTICS IN FISHERIES AND AQUATIC ECOLOGY” <http://www.ifremer.fr/sympafae/>
- “Hydroacoustic Protocol - Lakes, Reservoirs and Lowland Rivers” (for fish assessment) [http://www.pnamp.org//web/workgroups/FPM/meetings/2005\\_1205/2005\\_1202Hydroacoustics-Lakes.doc](http://www.pnamp.org//web/workgroups/FPM/meetings/2005_1205/2005_1202Hydroacoustics-Lakes.doc)
- Simmonds, E. John, and D. N. MacLennan. *Fisheries Acoustics: Theory and Practice*, second edition. Fish and aquatic resources series, 10. Oxford: Blackwell Science, 2003. ISBN 978-0-632-05994-2.

### 11.7.14 Further reading

- Canada: Stable Sonics, Time Magazine, October 28, 1946. An interesting account of the 4,800 ASDIC sonar devices secretly manufactured at Casa Loma, Toronto, during World War II. Retrieved 25 Sept. 2009.
- “Radar of the Deep - SONAR”, November 1945, *Popular Science* one of the best general public articles on the subject

# Chapter 12

## Other

### 12.1 Taiwan Relations Act Affirmation and Naval Vessel Transfer Act of 2014

The **Taiwan Relations Act Affirmation and Naval Vessel Transfer Act of 2014** (H.R. 3470) is a bill that would allow the sale of several Oliver Hazard Perry-class frigates to Mexico, Thailand, and Taiwan.\* [1] Four naval vessels would be sold to Taiwan for about \$10 million each.\* [2] Mexico and Thailand would each receive two vessels as a grant.\* [1]

The bill was introduced into the United States House of Representatives during the 113th United States Congress.

#### 12.1.1 Background

The Oliver Hazard Perry-class frigate is a class of frigates named after the American Commodore Oliver Hazard Perry, the hero of the naval Battle of Lake Erie. Also known as the Perry or FFG-7 class, the warships were designed in the United States in the mid-1970s as general-purpose escort vessels inexpensive enough to be bought in large quantities to replace World War II-era destroyers and 1960s-era Knox class frigates. Intended to protect amphibious landing forces, supply and replenishment groups, and merchant convoys from submarines, they also later were part of battleship-centric surface action groups and aircraft carrier battle groups/strike groups.\* [3] Fifty-five ships were built in the United States: 51 for the United States Navy and four for the Royal Australian Navy (RAN). In addition, eight were built in the Republic of China (Taiwan), six in Spain, and two in Australia for their navies. Former U.S. Navy warships of this class have been sold or donated to the navies of Bahrain, Egypt, Poland, Pakistan, and Turkey.

The Taiwan Relations Act (Pub.L. 96–8, 93 Stat. 14, enacted April 10, 1979; H.R. 2479) is an act of the United States Congress that has defined the non-diplomatic relations between the United States and the residual Republic of China on Taiwan since the United States diplomatically recognized the People's Republic of China as "China". The law, passed in 1979, governs U.S.-Taiwan relations

and opens up the possibility that the United States may offer Taiwan military assistance if Taiwan is ever attacked by China.\* [4]

#### 12.1.2 Provisions of the bill

*This summary is based largely on the summary provided by the Congressional Research Service, a public domain source.\* [1]*

The Taiwan Relations Act Affirmation and Naval Vessel Transfer Act of 2014 would authorize the President to transfer on a grant basis to Mexico, the *Oliver Hazard Perry*-class guided missile frigates *Curts* and *McClusky*; and (2) to Thailand, the *Oliver Hazard Perry*-class guided missile frigates *Rentz* and *Vandegrift*.\* [1]



Oliver Hazard Perry-class frigates underway in 1982

The bill would authorize the President to transfer on a sale basis the *Oliver Hazard Perry*-class guided missile frigates *Taylor*, *Gary*, *Carr*, and *Elrod* to the Taipei Economic and Cultural Representative Office of the United States (which is the Taiwan instrumentality designated pursuant to the Taiwan Relations Act).\* [1]

The bill would authorize the President, when transferring any vessel named in this Act, to ensure that the total number of vessels transferred to a country named in this Act does not exceed the total number authorized for transfer to that country.\* [1]

The bills would state that: (1) the value of such vessels transferred on a grant basis shall not be counted against

the aggregate value of excess defense articles transferred to countries in any fiscal year under the **Foreign Assistance Act of 1961**; (2) transfer costs shall be charged to the recipient; and (3) the country to which a vessel is transferred shall have necessary vessel repair and refurbishment carried out at U.S. shipyards (including U.S. Navy shipyards) to the maximum extent practicable.\*[1]

The bill would terminate transfer authority three years after enactment of this Act.\*[1]

The bill would amend the **Arms Control Act** to increase congressional notification thresholds for certain foreign military and commercial sales.\*[1]

The bill would declare that: (1) a defense-related license or other approval from the **United States Department of State** may also authorize the export of items subject to the **Export Administration Regulations** if such items are to be used in or with defense articles controlled on the **United States Munitions List**; and (2) separate **United States Department of Commerce** approval shall not be required, but such items shall remain under Department of Commerce jurisdiction with respect to any subsequent transactions.\*[1]

### 12.1.3 Congressional Budget Office report

*This summary is based largely on the summary provided by the **Congressional Budget Office**, As ordered reported by the House Committee on Foreign Affairs on November 20, 2013. This is a public domain source.\*[2]*

H.R. 3470 would authorize the **President** to sell four naval vessels to **Taiwan**. The **Congressional Budget Office** (CBO) estimates that those sales would increase offsetting receipts (thus, reducing direct spending) by \$40 million over the 2014-2024 period. Because enacting the bill would affect direct spending, **pay-as-you-go** procedures apply. Enacting the bill would not affect revenues, and implementing it would have insignificant effects on spending subject to appropriation.\*[2]

Section 101 would authorize the sale of naval vessels. That authority would expire three years after the bill is enacted. Based on information from the **United States Navy**, the CBO estimates that all four vessels would be sold over that period, for about \$10 million each. Those funds would be deposited in the Treasury as offsetting receipts. The bill also specifies vessels that may be transferred to certain nations by grant. Under the bill, any additional costs related to authorized sales or transfers, including costs for refurbishing the vessels, would be paid by the recipient countries. Such amounts are typically paid directly to the private shipyard that does the work.\*[2]

H.R. 3470 contains no intergovernmental or private-sector mandates as defined in the **Unfunded Mandates Reform Act** and would impose no costs on state, local, or tribal governments.\*[2]

On December 20, 2013, CBO published an estimate for S. 1683, the **Naval Vessel Transfer Act of 2013**, as reported by the **United States Senate Committee on Foreign Relations** on November 14, 2013. Section 102 of that bill is similar to section 101 of H.R. 3470, and we estimate that both provisions would have the same budgetary effect.\*[2]

### 12.1.4 Procedural history

The **Naval Vessel Transfer and Arms Export Control Amendments Act of 2013** was introduced into the **United States House of Representatives** on November 13, 2013 by Rep. Edward R. Royce (R, CA-39).\*[5] The bill was referred to the **United States House Committee on Foreign Affairs**. The bill was ordered to be reported by the committee on November 20, 2013 by unanimous consent. The bill's title was changed to the "Taiwan Relations Act Affirmation and Naval Vessel Transfer Act of 2014" on April 7, 2014, when the bill was passed by the House in a voice vote.\*[5]

### 12.1.5 Debate and discussion

Rep. Ed Royce (R-CA) argued in favor of the bill saying that "these ships would bolster Taiwan's defense." \*[4] Royce also said that "these transfers help support the priorities of the U.S. Navy while strengthening the capability of allies and our close partners to meet our share maritime security objectives." \*[4]

Taiwanese newspaper *The China Post* reported that the Taiwanese military expected to receive two of the ships in 2015.\*[6] The four ships that would be sold to Taiwan under this bill were all commissioned between 1984 and 1985.\*[6] In addition to purchasing these ships to replace several older 1960s U.S.-built ships that Taiwan got from the U.S. in the 1990s, Taiwan is also thinking about building its own naval vessels.\*[6]

### 12.1.6 See also

- List of bills in the 113th United States Congress

### 12.1.7 References

- [1] "H.R. 3470 - Summary". United States Congress. Retrieved 8 April 2014.
- [2] "H.R. 3470 - CBO" (PDF). Congressional Budget Office. Retrieved 5 April 2014.
- [3] Wiggins, James F (August 2000). *Defense Acquisitions: Comprehensive Strategy Needed to Improve Ship Cruise Missile Defence*. United States General Accounting Office. ISBN 978-0-7567-0302-8. Retrieved 2010-02-16. pp.42

- [4] Marcos, Cristina (7 April 2014). “House approves sale of missile frigates to Taiwan” . *The Hill*. Retrieved 8 April 2014.
- [5] “H.R. 3470 - All Actions” . United States Congress. Retrieved 8 April 2014.
- [6] Yeh, Joseph (22 November 2013). “Taiwan to receive two US-made frigates in 2015” . *The China Post*. Retrieved 8 April 2014.

### 12.1.8 External links

- Library of Congress - Thomas H.R. 3470
- beta.congress.gov H.R. 3470
- GovTrack.us H.R. 3470
- OpenCongress.org H.R. 3470
- WashingtonWatch.com H.R. 3470

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# Chapter 13

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### 13.1 Text

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- **Oliver Hazard Perry** *Source:* [https://en.wikipedia.org/wiki/Oliver\\_Hazard\\_Perry?oldid=694016964](https://en.wikipedia.org/wiki/Oliver_Hazard_Perry?oldid=694016964) *Contributors:* Amillar, Lorax, Mir-win, Rmhermen, William Avery, Jinian, Hephaestos, Ubiquity, Kalki, Minesweeper, Stan Shebs, Suisui, Arteitle, Jengod, Adam Bishop, Kirk!, Bcorr, Jni, Bearcat, Postdlf, UtherSRG, TOO, DocWatson42, Everything, Bkonrad, Niteowlneils, Bobblewik, Cape cod naturalist, Cynical, TiMike, Neutrality, Klemen Kocjancic, WikiDon, D6, N328KF, Rich Farmbrough, Carptrash, Bender235, PedanticallySpeaking, EurekaLott, Orlady, Guettarda, Directorstratton, AKGhetto, AzaToth, Great Scott, Malo, Wtmitchell, Bbsrock, Richard Arthur Norton (1958- ), PatGallacher, Macaddct1984, Kralizec!, Edison, Mayumashu, Rogerd, Bhadani, Yamamoto Ichiro, Cacafuego95, Windchaser, KFP, Hall Monitor, FrankTobia, YurikBot, Daverocks, Jimwox, Witan, Pseudomonas, Big Brother 1984, Jeffmwalcoff, Grafen, Jaxl, Welsh, Carajou, Ruhrfisch, Write On 1983, Dahveed323, Ospalh, Darthballs, IP 66.173.44.202, Severence, Windyjarhead, Scoutersig, Katieh5584, Elliskev, SmackBot, M dorothy, Prodego, Imzadi1979, Yamaguchi 先生, Gilliam, TDS, Movementarian, Rmt2m, Ryecatcher773, Tsca.bot, Greg the White Falcon, Shunpiker, Nibuod, Bigturtle, EVula, Dvorak729, Ohconfucius, Esrever, FirstDrop87, Ser Amantio di Nicolao, SilverStar, Jrt989, Galactor213, Haus, Ghostmonkey57, MrFish, Cydebot, Sammy Houston, Steel, Chrislk02, Pmoreland24, Aldis90, PKT, FrancoGG, Epbr123, Auror, Headbomb, SGGH, Luna Santin, StringRay, Fayenatic london, Niagara, Barek, Magioladits, Freedominlinux, Bongwarrior, VoABot II, QuizzicalBee, Doug Coldwell, Allstarecho, JaGa, Keith D, CommonsDelinker, Cyrus Andiron, Polimek, J.delanoy, AlphaFactor, Octopus-Hands, Tiakalla, TBone5521, NewEnglandYankee, Waasup, WildManKY, Student7, Johnpdeever, Martial75, Pnoble805, Tesscass, Magnet For Knowledge, Benhur767, Wikiwag, LeaveSleaves, Cremepuff222, Scoop100, Rolandgunner5, Maxim, Billinghurst, Waveoff, Rontrigger, JediMasterPeP, StAnselm, Ipankonin, Pubdog, Arda Xi, Flyer22 Reborn, Triggerpull2, Kumioko (renamed), JMOPprof, Janggeom, MBK004, ClueBot, Parkwells, P. S. Burton, Masterblooregard, Ktr101, Erebus Morgaine, Rhatsa26X, EBY3221, 7&6=thirteen, Sturm vogel 66, Bone wah, Otoolebe, Thingg, Pennsy22, Berean Hunter, Wzevon-fan, Acecombat5, Felix Folio Secundus, Addbot, RPHv, Otisjimmy1, Download, Tassedethe, The Bushranger, Arxiloxos, Luckas-bot, Yobot, Fraggie81, ArchonMagnus, THEN WHO WAS PHONE?, KamikazeBot, Magicpiano, Arjun G. Menon, Piano non troppo, Citation bot, RevelationDirect, LilHelpa, Quazgaa, Ahodges7, FrescoBot, Darkstar8799, HJ Mitchell, WikiBoy147, Hchc2009, Michitaro, Gregory J Kingsley, Mchlmcy, Ethan2226, Callanecc, Vrenator, RjwilmsiBot, EmausBot, Diiscool, GoingBatty, Gwillhickers, Tommy2010, Engineer Bill, Wikipelli, Hensel96, Habstinat, Brandmeister, \$1LENCE D00600D, ClueBot NG, DTParker1000, Spartan7W, Widr, Vibhijain, Helpful Pixie Bot, Pcharchivist, PhnomPencil, ElphiBot, MusikAnimal, Compfreak7, Shefferm, Soerfm, Jeancey, Hamish59, BattyBot, YFdyh-bot, Nickelfan, VIAFBot, SamSennett, Castoriva, Strawberry8332, Ugog Nizdast, How Shuan Shi, Poopyface666, Xylemphone, Oaklawny, TRLogan, HolyWarriorTim, JDeWPV, KasparBot and Anonymous: 232
- **Frigate** *Source:* <https://en.wikipedia.org/wiki/Frigate?oldid=696623910> *Contributors:* The Epopt, Bryan Derksen, EdwardOConnor, Rjs-

tott, Peterlin~enwiki, Panairjdde~enwiki, Nonenmac, Edward, Samnse, Egil, Stan Shebs, Andrewa, Julesd, Lupinoid, Glenn, Bogdan-giusca, The Tom, Charles Matthews, Tpbradbury, Nv8200pa, Wetman, Frazzydee, Lumos3, Robbot, Pibwl, Stephan Schulz, Profoss, SoLando, Jooler, Carnildo, Obbop, Dbenbenn, Everyking, Aoi, H-2-O, BigBen212, Iceberg3k, Grant65, Just Another Dan, Bobblewik, IMFJ, Gdr, H1523702, Jonel, LucasVB, The Land, Karl-Henner, Blue387, Acad Ronin, Faedra, Klemen Kocjancic, N328KF, Discospinster, Rich Farmbrough, Guanabot, Rama, Mecanismo, SpookyMulder, Petersam, Violetriga, Aqua008, Kwamikagami, Sietse Snel, Art LaPella, Smalljim, Get It, Kevin Myers, Travisyoung, Joshuaumgartner, Sandstig, Ahruman, Sligoocki, Malo, Sobolewski, RPH, Vedant, Kerry7374, BrentN, ScottDavis, Jason Palpatine, Pol098, TheoClarke, GraemeLeggett, Graham87, Chun-hian, Island, Nautical, Ian Dunder, MWAK, FlaBot, Kallemax, Jcmurphy, Bmpower, ZDanimal, Catsmeat, Mark83, Tijuana Brass, Fosnez, MoRsE, Chobot, Ben-lisquare, YurikBot, Noclador, Hairy Dude, RussBot, John Smith's, Hydrargyrum, Spot87, Saberwyn, Deepak~enwiki, Pawyilee, Pi156, Calaschysm, Ageekgal, Petri Krohn, Garion96, Alureiter, GMan552, Victor falk, Luk, SmackBot, Emoscopes, Mihalyia~enwiki, KVDP, Arny, Kintetsubuffalo, Andrewkantor, Srnec, By78, Peter Isotalo, Hmains, Quadm, Bluebot, TimBentley, Mxiong, Gadren, Hibernian, Colonies Chris, Dual Freq, Jdthood, Ashawley, OrphanBot, Rrburke, Celarnor, Nakon, Gammasts, EVula, Runcorn, LeoNomis, Vina-iwbot~enwiki, DCB4W, Ergative rlt, Vgy7ujm, SilkTork, JoshuaZ, PRRfan, Viv Hamilton, Meitavlord2007, Iridescent, Mliggett, Joe-Bot, Haus, Provocateur, Hokeman, Saenen, Eluchil404, CmdrObot, Fnlayson, Keeshu, Odie5533, Nottheaking, Victoriaedwards, Aldis90, JohnInDC, Thijs'bot, Wikid77, Jmg38, Kablammo, 24fan24, Hcobb, J Clear, WinBot, Opelio, Ingolfson, JAnDbot, Deflective, Arch dude, Chanakyathegreat, Nlkrio, Postcaptain, Appraiser, Buckshot06, JaceCady, Rich257, Jaiotu, BilCat, Rupert Nichol, Elizabethreed, Rif Winfield, Martocticvs, Bieb, Walle83, EyeSerene, Sm8900, Urselius, CommonsDelinker, Nono64, Mikek999, J.delanoy, Public Menace, Tokyogirl79, Mrg3105, Wiki1609, Robertgreer, Christopher Kraus, Cometstyles, Paularblaster, TKMoreno, VatooVatoo, TXiKiBoT, Caster23, Mywikieditor2007, Lradrama, Don4of4, StillTrill, LanceBarber, Falcon8765, Ljnz22, Quantpole, Solicitr, Aqwfyj, SieBot, Euryalus, نصرانی، Benea, Lightmouse, Finkefamily, Dodger67, Hamiltondaniel, EmanWilm, ImageRemovalBot, Dlrohrer2003, Monkeychubs, MBK004, ClueBot, Captain Phoebus, Binksternet, Fruitson, Cloudaoc, Nigeltd, Masterblooregard, Sv1xv, Excirial, Dicc93, Sturmvogel 66, Shem1805, Jellyfish dave, Warheit1975, XLinkBot, DidiWeidmann, Alansplodge, Wyatt915, Addbot, Stephen Fulcher, Magus732, Download, AndersBot, AnnaFrance, SpBot, Mdnavman, DinoBot2, Lightbot, Quantumobserver, Legobot, Luckas-bot, Yobot, Gaston200, Rsquire3, Sorruno, IW.HG, KDS4444, lexec1, LlywelynII, Ufim, Materialscientist, Surigat, LilHelpa, Xqbot, Syameer95, DSisypBot, Date delinker, Chen Guangming, Micemug, Riotrocket8676, Anotherclown, Thehelpfulbot, FrescoBot, Zachlast, Rgvis, Aogouguo, Reynold12, King Zebu, Fui in terra aliena, Carel.jonkhout, Bcs09, Koakhtzvigad, Cnwilliams, Lotje, Dinamik-bot, ArwinJ, DexDor, Weakopedia, EmausBot, WikitanvirBot, Gwillhickers, Evertsenf805, Ao333, Ykraps, HiW-Bot, Illegitimate Barrister, BrokenAnchorBot, Portsis, Iron Archer, Quite vivid blur, Thewolffchild, Karlmontague, ChuispastonBot, Viking1808, Spicemix, ClueBot NG, Jack Greenmaven, Skjoldbro, MelbourneStar, AktiNo, McLarenshen, Mightyoceaan, Jurium, The lost library, Soufle, BG19bot, Mirradian, Soerfm, Xtian06, America789, ChrisGualtieri, Maartenschrijft, Orcabro37, TKer193, Pawlowes, Themightydeepblueocean, Llammakey, Maths314, Caprockranger, Xenos io26, Николай Адамович Ткаченко, Gabriel Nicole and Anonymous: 264

- **USS Oliver Hazard Perry (FFG-7)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Oliver\\_Hazard\\_Perry\\_\(FFG-7\)?oldid=695869515](https://en.wikipedia.org/wiki/USS_Oliver_Hazard_Perry_(FFG-7)?oldid=695869515) *Contributors:* Jinian, David Newton, Iceberg3k, Gdr, WikiDon, Wtmitchell, Bellhalla, Tony1, Florian Adler, Dual Freq, A. B., Sambot, STB-1, Beetstra, PRRfan, Haus, Eluchil404, Cydebot, Harvardlaw, EarthPerson, Num1gen, Asoprano, JohnTopShelf, MBK004, PipepBot, Nicieguyedc, PixelBot, Pinkpedaller, Pennsy22, XLinkBot, Addbot, Tide rolls, Ffgfred, Николай Путин, OffiMcSpin, Full-date unlinking bot, Trappist the monk, Macxtom, DexDor, Molestash, Augiecalisi, Skr15081997, Monkbot, Llammakey, F0rteOC, Luis Santos24 and Anonymous: 14
- **USS McInerney (FFG-8)** *Source:* [https://en.wikipedia.org/wiki/USS\\_McInerney\\_\(FFG-8\)?oldid=696145991](https://en.wikipedia.org/wiki/USS_McInerney_(FFG-8)?oldid=696145991) *Contributors:* Catherine-Munro, Darkwind, David Newton, Wwoods, Gdr, Mtnerd, Travisyoung, Woohookitty, Bellhalla, ViriiK, Wavelength, Phantomsteve, Russ-Bot, Wiki alf, Saberwyn, Gadget850, Cla68, Dual Freq, A. B., Godanov, Ohconfucius, Sambot, STB-1, Accurizer, Beetstra, Haus, Harej bot, Cydebot, Fnlayson, Brad101, Bitball, PalawanOz, Chanakyathegreat, Buckshot06, BatteryIncluded, Aureez, Marcd30319, New Hampshire, Midshipmanx, Sonicjosh, Smsarmad, Lightmouse, Maralia, MBK004, ClueBot, Arjayay, Pennsy22, Superfire, Addbot, Jncraton, CarsracBot, Yobot, AnomieBOT, Ipatrol, AnAnthro, Daveman1975, Sputink, FrescoBot, Bcs09, Trappist the monk, Rronton, Fry1989, TGCP, John of Reading, AlphaGamma1991, Tomseatle, AdventurousSquirrel, BTRand1, WPGA2345, Monkbot, Luis Santos24 and Anonymous: 42
- **USS Wadsworth (FFG-9)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Wadsworth\\_\(FFG-9\)?oldid=696194896](https://en.wikipedia.org/wiki/USS_Wadsworth_(FFG-9)?oldid=696194896) *Contributors:* Zundark, Rmhermen, David Newton, Halibutt, Radomil, Wwoods, Gdr, CruiserBob, Bellhalla, FlaBot, ViriiK, Mieciu K, SmackBot, Bluebot, Colonies Chris, Dual Freq, A. B., OrphanBot, Ohconfucius, Sambot, STB-1, Beetstra, Haus, Cydebot, Dbromage, Harvardlaw, Earth-Person, OS1Nelson, Lightmouse, MBK004, Pennsy22, Yobot, Ffgfred, FrescoBot, Trappist the monk, EmausBot, SporkBot, Gettyng, Monkbot, Llammakey, F0rteOC, Luis Santos24 and Anonymous: 10
- **USS Duncan (FFG-10)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Duncan\\_\(FFG-10\)?oldid=699807356](https://en.wikipedia.org/wiki/USS_Duncan_(FFG-10)?oldid=699807356) *Contributors:* David Newton, Gdr, Geo Swan, Bellhalla, Kolbasz, ViriiK, Wavelength, Saberwyn, SmackBot, Bluebot, Dual Freq, A. B., Ohconfucius, Sambot, STB-1, Beetstra, DI2000, Haus, Cydebot, Llort, Harvardlaw, EarthPerson, Nigel Ish, Lightmouse, MBK004, Pennsy22, Addbot, CarsracBot, PRL42, 5inch50, AnomieBOT, FrescoBot, Trappist the monk, Fettlemap, Monkbot and Anonymous: 6
- **USS Clark (FFG-11)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Clark\\_\(FFG-11\)?oldid=696287370](https://en.wikipedia.org/wiki/USS_Clark_(FFG-11)?oldid=696287370) *Contributors:* Rmhermen, Stefan-S, David Newton, Radomil, Gdr, Susvolans, Bellhalla, Marshcmb, ViriiK, CraigRNielsen, SmackBot, Bluebot, TheFeds, Dual Freq, A. B., Ohconfucius, Sambot, STB-1, Beetstra, Haus, Cydebot, Brad101, Dawkeye, Harvardlaw, EarthPerson, Lightmouse, MBK004, Pennsy22, XLinkBot, Addbot, Mdnavman, FrescoBot, Trappist the monk, BG19bot, Monkbot, Llammakey and Anonymous: 11
- **USS George Philip (FFG-12)** *Source:* [https://en.wikipedia.org/wiki/USS\\_George\\_Philip\\_\(FFG-12\)?oldid=695874814](https://en.wikipedia.org/wiki/USS_George_Philip_(FFG-12)?oldid=695874814) *Contributors:* David Newton, Jimc, Gdr, Rich Farmbrough, Get It, Nuno Tavares, Bellhalla, XLerate, Durin, ViriiK, YurikBot, SmackBot, Chris the speller, Bluebot, Dual Freq, A. B., Derekbridges, Ohconfucius, Sambot, STB-1, Beetstra, DI2000, Haus, Cydebot, Harvardlaw, Seaphoto, EarthPerson, Kateshortforbob, MBK004, Pennsy22, DumZiBoT, Addbot, Yobot, AnomieBOT, Full-date unlinking bot, Trappist the monk, Martonosi, SporkBot, ChrisGualtieri, WPGA2345, Monkbot, Llammakey and Anonymous: 7
- **USS Samuel Eliot Morison (FFG-13)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Samuel\\_Eliot\\_Morison\\_\(FFG-13\)?oldid=696141739](https://en.wikipedia.org/wiki/USS_Samuel_Eliot_Morison_(FFG-13)?oldid=696141739) *Contributors:* The Epopt, David Newton, Bobblewik, Gdr, N328KF, Rich Farmbrough, Zscout370, CeeGee, Travisyoung, Malo, Harej, Alai, Bellhalla, TomTheHand, WB2, ViriiK, Nick-D, SmackBot, Bluebot, Dual Freq, A. B., Zbot370, Ohconfucius, Sambot, STB-1, Beetstra, Haus, Cydebot, Wikid77, E104421, Vkt183, Nigel Ish, AHMartin, Maralia, MBK004, Pennsy22, Trappist the monk, EmausBot, SporkBot, Zinzinzbidi, Drewgarlick, Monkbot, Llammakey, Luis Santos24 and Anonymous: 7
- **USS Sides (FFG-14)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Sides\\_\(FFG-14\)?oldid=696132314](https://en.wikipedia.org/wiki/USS_Sides_(FFG-14)?oldid=696132314) *Contributors:* David Newton, Gdr, Mtnerd, Get It, Nuno Tavares, Bellhalla, Durin, YurikBot, Attilios, SmackBot, Chris the speller, Bluebot, Dual Freq, A. B., Ohconfucius,

Sambot, STB-1, Nobunaga24, Beetstra, Haus, Cydebot, Jacobst, EricSerge, Falcon8765, Drutt, MBK004, Pennsy22, DumZiBoT, Addbot, Citation bot, FrescoBot, Full-date unlinking bot, Trappist the monk, John of Reading, CitationCleanerBot and Anonymous: 11

- **USS Estocin (FFG-15)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Estocin\\_\(FFG-15\)?oldid=696139324](https://en.wikipedia.org/wiki/USS_Estocin_(FFG-15)?oldid=696139324) *Contributors:* David Newton, Gdr, CeeGee, Bellhalla, Durin, ViriiK, SmackBot, Chris the speller, Bluebot, TheFeds, Dual Freq, A. B., Jwillbur, Sambot, STB-1, Beetstra, DI2000, Haus, Cydebot, E104421, Cobatfor, MBK004, Pennsy22, Addbot, Yobot, AnomieBOT, 1exec1, Trappist the monk, SporkBot, Llammakey and Anonymous: 6
- **USS Clifton Sprague (FFG-16)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Clifton\\_Sprague\\_\(FFG-16\)?oldid=696139031](https://en.wikipedia.org/wiki/USS_Clifton_Sprague_(FFG-16)?oldid=696139031) *Contributors:* Magnus Manske, David Newton, Wwoods, Gdr, Sam Hocevar, Mtnerd, CeeGee, Bellhalla, TomTheHand, ViriiK, RussBot, SmackBot, Daysleeper47, Bluebot, Dual Freq, Ohconfucius, Sambot, Beetstra, DI2000, Haus, CmdrObot, Cydebot, KConWiki, Hirokun, Lightmouse, MBK004, Pennsy22, Addbot, AnomieBOT, FrescoBot, Trappist the monk, WPGA2345, Llammakey and Anonymous: 5
- **USS John A. Moore (FFG-19)** *Source:* [https://en.wikipedia.org/wiki/USS\\_John\\_A.\\_Moore\\_\(FFG-19\)?oldid=696287529](https://en.wikipedia.org/wiki/USS_John_A._Moore_(FFG-19)?oldid=696287529) *Contributors:* David Newton, Gdr, Klemen Kocjancic, CeeGee, Bellhalla, ViriiK, SmackBot, Bluebot, Dual Freq, A. B., Ohconfucius, Sambot, Beetstra, LeyteWolfer, Haus, Cydebot, E104421, STBotD, SieBot, RSSStockdale, MBK004, Pennsy22, Life of Riley, CubBC, Yobot, AnomieBOT, RibotBOT, FrescoBot, Full-date unlinking bot, Trappist the monk, EmausBot, SporkBot, Artur.Linhart, WPGA2345, Llammakey, FOrteOC and Anonymous: 5
- **USS Antrim (FFG-20)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Antrim\\_\(FFG-20\)?oldid=696139147](https://en.wikipedia.org/wiki/USS_Antrim_(FFG-20)?oldid=696139147) *Contributors:* David Newton, Wwoods, Gdr, CeeGee, Bellhalla, ViriiK, Mjroots, SmackBot, Bluebot, Dual Freq, A. B., OrphanBot, JWilliamCupp, Ohconfucius, Sambot, Beetstra, Haus, Cydebot, Brad101, Pustelnik, Hcobb, E104421, STBotD, Lightmouse, MBK004, Pennsy22, FueGo, Addbot, Eugene-elgato, FrescoBot, Jonesey95, Trappist the monk, John of Reading, Frietjes, Htpilly, Llammakey, FOrteOC and Anonymous: 9
- **USS Flatley (FFG-21)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Flatley\\_\(FFG-21\)?oldid=696138098](https://en.wikipedia.org/wiki/USS_Flatley_(FFG-21)?oldid=696138098) *Contributors:* David Newton, Wwoods, Alexf, Gdr, CeeGee, Bellhalla, ViriiK, Jimp, SmackBot, Lordandmaker, Bluebot, Dual Freq, A. B., Sambot, Beetstra, Haus, Cydebot, Brad101, Dricherby, E104421, HJ32, SieBot, MBK004, Pennsy22, Addbot, Yobot, 1exec1, Full-date unlinking bot, Trappist the monk, Llammakey and Anonymous: 10
- **USS Fahrion (FFG-22)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Fahrion\\_\(FFG-22\)?oldid=696147350](https://en.wikipedia.org/wiki/USS_Fahrion_(FFG-22)?oldid=696147350) *Contributors:* David Newton, Gdr, Joshbaumgartner, Bellhalla, ViriiK, SmackBot, Bluebot, Dual Freq, A. B., Ohconfucius, Sambot, Beetstra, Haus, Cydebot, Brad101, Magioladitis, STBotD, MBK004, Pennsy22, Jasonstru, Addbot, Yobot, Full-date unlinking bot, Trappist the monk, Helpful Pixie Bot, Mrrobot02338 and Anonymous: 9
- **USS Lewis B. Puller (FFG-23)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Lewis\\_B.\\_Puller\\_\(FFG-23\)?oldid=696148972](https://en.wikipedia.org/wiki/USS_Lewis_B._Puller_(FFG-23)?oldid=696148972) *Contributors:* Hephaestos, David Newton, Gdr, Bellhalla, TomTheHand, Durin, ViriiK, SmackBot, Bluebot, Dual Freq, Sambot, Beetstra, Haus, Cydebot, Brad101, Magioladitis, Marcd30319, Hirokun, MBK004, Pennsy22, 1exec1, Le Deluge, Full-date unlinking bot, Trappist the monk, EmausBot, SporkBot, Helpful Pixie Bot and Anonymous: 4
- **USS Jack Williams (FFG-24)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Jack\\_Williams\\_\(FFG-24\)?oldid=696157110](https://en.wikipedia.org/wiki/USS_Jack_Williams_(FFG-24)?oldid=696157110) *Contributors:* Rmhermen, David Newton, Wwoods, Gdr, Pmsyyz, Travisyoung, A2Kafir, Harej, Alai, Bellhalla, WB2, ViriiK, Cornellrockey, Russ-Bot, Wiki alf, Florian Adler, A. B., AP1787, Ser Amantio di Nicolao, Sambot, Beetstra, Haus, Supersquid, IntrigueBlue, Cydebot, Wilsbadkarma, Hirokun, EricSerge, MBK004, PipepBot, Kanguole, Pennsy22, Addbot, Mdnnavman, Rehman, Yobot, TaBOT-zerem, 1exec1, Full-date unlinking bot, Trappist the monk, Hmainbsot1, Monkbot and Anonymous: 7
- **USS Copeland (FFG-25)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Copeland\\_\(FFG-25\)?oldid=696195407](https://en.wikipedia.org/wiki/USS_Copeland_(FFG-25)?oldid=696195407) *Contributors:* Jinian, David Newton, Gdr, Arvis21, Zscout370, Harej, Bellhalla, WB2, ViriiK, RussBot, SmackBot, Bluebot, Dual Freq, A. B., Derekbridges, AussieLegend, Sambot, Beetstra, Haus, Cydebot, Magioladitis, 67Rally, Hirokun, Lightmouse, MBK004, Earthgoogler, Pennsy22, XLinkBot, 1exec1, FrescoBot, Jonesey95, Trappist the monk, EmausBot, SporkBot, Helpful Pixie Bot, CopelandFFG25, Llammakey and Anonymous: 7
- **USS Gallery (FFG-26)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Gallery\\_\(FFG-26\)?oldid=696159559](https://en.wikipedia.org/wiki/USS_Gallery_(FFG-26)?oldid=696159559) *Contributors:* David Newton, Wwoods, Gdr, Bellhalla, ViriiK, SmackBot, Bluebot, Dual Freq, A. B., Ohconfucius, Sambot, Beetstra, Haus, Cydebot, Magioladitis, Felix Stember, Hirokun, MBK004, Pennsy22, Addbot, Xqbot, Full-date unlinking bot, Trappist the monk, 423lumps, Helpful Pixie Bot, Monkbot and Anonymous: 6
- **USS Mahlon S. Tisdale (FFG-27)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Mahlon\\_S.\\_Tisdale\\_\(FFG-27\)?oldid=696146634](https://en.wikipedia.org/wiki/USS_Mahlon_S._Tisdale_(FFG-27)?oldid=696146634) *Contributors:* David Newton, Gdr, CeeGee, Bellhalla, ViriiK, SmackBot, Cla68, Bluebot, Dual Freq, A. B., Ohconfucius, Sambot, Nobunaga24, Beetstra, DI2000, Haus, Cydebot, Magioladitis, E104421, Emeraude, SieBot, Cobatfor, MBK004, Pennsy22, Addbot, Yobot, AnomieBOT, FrescoBot, Full-date unlinking bot, Trappist the monk, SporkBot, Selin1005, Monkbot and Anonymous: 5
- **USS Boone (FFG-28)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Boone\\_\(FFG-28\)?oldid=696160876](https://en.wikipedia.org/wiki/USS_Boone_(FFG-28)?oldid=696160876) *Contributors:* David Newton, Gdr, CanisRufus, Travisyoung, Andrew Gray, Harej, Bellhalla, Melesse, Durin, Who, ViriiK, MikeyChalupa, Wiki alf, SmackBot, Jim62sch, Daysleeper47, Janm67, A. B., AP1787, Jwillbur, Elendil's Heir, Ohconfucius, Sambot, Sevey13, Beetstra, Haus, CmdrObot, Mnusnf, Cydebot, Brad101, Hcobb, Dricherby, Jvclude, Hirokun, Lightmouse, Kumiko (renamed), MBK004, Pennsy22, Addbot, Toyokuni3, Lightbot, Citation bot, FrescoBot, Trappist the monk, Ja3jo1, Llammakey, Luis Santos24 and Anonymous: 13
- **USS Stephen W. Groves (FFG-29)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Stephen\\_W.\\_Groves\\_\(FFG-29\)?oldid=696162481](https://en.wikipedia.org/wiki/USS_Stephen_W._Groves_(FFG-29)?oldid=696162481) *Contributors:* David Newton, Wwoods, Iceberg3k, Gdr, Travisyoung, A2Kafir, Alai, Bellhalla, XLerate, Durin, ViriiK, RussBot, Wiki alf, Chris the speller, A. B., Ohconfucius, JKBrooks85, Sambot, Beetstra, Haus, Harej bot, Dorkbert, Cydebot, Sonar1313, Brad101, Hcobb, Wilsbadkarma, BrokenSphere, Navy1775, Jvclude, Hirokun, XavierGreen, McM.bot, Falcon8765, Lightmouse, MBK004, Arentath8, Arjayay, Pennsy22, Addbot, Mdnnavman, 1exec1, FrescoBot, Trappist the monk, John of Reading, Nauticalfreak, WPGA2345 and Anonymous: 15
- **USS Reid (FFG-30)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Reid\\_\(FFG-30\)?oldid=696164032](https://en.wikipedia.org/wiki/USS_Reid_(FFG-30)?oldid=696164032) *Contributors:* Stan Shebs, David Newton, Kirk!, Gdr, CeeGee, Travisyoung, Bellhalla, ViriiK, SmackBot, Jfurr1981, Cla68, Bluebot, Dual Freq, A. B., Grimmtooth, Wybot, NeilFraser, Ohconfucius, Sambot, Beetstra, Haus, Harej bot, Cydebot, E104421, Hirokun, MBK004, Pennsy22, Chamael N, Yobot, RibotBOT, FrescoBot, Full-date unlinking bot, Trappist the monk, EmausBot, John of Reading, Maurice Flesier and Anonymous: 6
- **USS Stark (FFG-31)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Stark\\_\(FFG-31\)?oldid=697104123](https://en.wikipedia.org/wiki/USS_Stark_(FFG-31)?oldid=697104123) *Contributors:* Jinian, Rgable, Jengod, David Newton, Timc, Echoray, StinKerr, Korath, Lyellin, PBP, Itpastorn, Bobblewik, Gdr, Beland, FelineAvenger, ScottyBoy900Q, Bbpenn, Klemen Kocjancic, Rfl, N328KF, Fvdham, Rama, Zscout370, Nonpareiltry, Circeus, TomStar81, Maureen, Travisyoung, Sherurcij, Arthena, Denniss, Malo, Rwendland, Evil Monkey, Harej, Bellhalla, TomTheHand, Hbdragon88, Dpv, Rjwilmsi, Susan Davis, Rogerd,

Valentinejoesmith, Darguz Parsilvan, Ligulem, FlaBot, WB2, NekoDaemon, CraigWyllie, ViriiK, Russavia, MoRsE, Ricroz, StuRat, Petri Krohn, That Guy, From That Show!, SmackBot, Hux, Jim62sch, Eaglizard, Eskimbot, Dual Freq, A. B., MJBurrage, Thatnewguy, Ohconfucius, Sambot, STB-1, Beetstra, PRRfan, MrDolomite, WilliamJE, Haus, Mharnar, OS2Warp, MarsRover, CompRhetoric, Fl295, Slazenger, Cydebot, Tec15, DulcetTone, J Clear, Seaphoto, Aspensti, Buckshot06, Nyttend, Ed416, JoDonHo, Chrisfow, Rohirrim63, AntiSpamBot, Lurkercowboy, Alterrabe, Walkchri, Gekritzl, Jasonw611, McM.bot, Kobalt64, SieBot, Wylleum, Lightmouse, Bert Schlossberg, Maralia, Celiqe, MBK004, Zeerak88, Socrates2008, Environnement2100, Pennsy22, Life of Riley, FatMatt55, Seanster42, Kbdankbot, Addbot, AkhtaBot, Navalhistorian, BbKiser, Spinteractive, Lightbot, Pepik70, Yobot, Librsh, Rogerspeed23, AnomieBOT, lexec1, Citation bot, Obersachsebot, Anon423, Srich32977, Plot Spoiler, Captain Cheeks, FrescoBot, Surv1v411st, Gire 3pitch2005, Citation bot 1, Full-date unlinking bot, Trappist the monk, RjwilmsiBot, DexDor, Mztourist, Prolyman, Bomazi, HandsomeFella, ClueBot NG, RufusJgreen, C.Carcharias, Kaltenmeyer, CitationCleanerBot, Titan2785, RangerRex85, Llammakey and Anonymous: 66

- **USS John L. Hall (FFG-32)** *Source:* [https://en.wikipedia.org/wiki/USS\\_John\\_L.\\_Hall\\_\(FFG-32\)?oldid=696165780](https://en.wikipedia.org/wiki/USS_John_L._Hall_(FFG-32)?oldid=696165780) *Contributors:* Wwoods, Iceberg3k, Gdr, Sole Soul, A2Kafir, Harej, Alai, Bellhalla, ViriiK, Bachrach44, Tbonnie, A. B., Sambot, Beetstra, MrDolomite, Haus, Mator, Cydebot, Brad101, Hcobb, Jvedude, Hirokun, Lightmouse, MBK004, Pennsy22, Life of Riley, XLinkBot, Addbot, Luckasbot, lexec1, FrescoBot, Trappist the monk, Patiro, Abfarmer and Anonymous: 14
- **USS Jarrett (FFG-33)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Jarrett\\_\(FFG-33\)?oldid=696396113](https://en.wikipedia.org/wiki/USS_Jarrett_(FFG-33)?oldid=696396113) *Contributors:* DocWatson42, Gdr, Ukexpat, TomStar81, Ashley Pomeroy, Bellhalla, ViriiK, RussBot, TheGuruTech, SmackBot, Cla68, Chris the speller, Bluebot, Florian Adler, Dual Freq, A. B., Trekphiler, Derekbridges, Sambot, STB-1, Beetstra, Haus, Cydebot, Nabokov, Marcd30319, BrokenSphere, Jvedude, Stanning, Lightmouse, MBK004, Hougy, Pennsy22, DumZiBoT, Addbot, Kimmymarie24, Yobot, Mackin90, Troymacgill, lexec1, Jim1138, Goodtimber, Trappist the monk, Kamran the Great, Llammakey and Anonymous: 18
- **USS Aubrey Fitch (FFG-34)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Aubrey\\_Fitch\\_\(FFG-34\)?oldid=696322290](https://en.wikipedia.org/wiki/USS_Aubrey_Fitch_(FFG-34)?oldid=696322290) *Contributors:* Wwoods, Gdr, Klemen Kocjancic, Canterbury Tail, Bellhalla, ViriiK, TheFeds, Dual Freq, A. B., Zvar, Ohconfucius, Sambot, Beetstra, PRRfan, Haus, Cydebot, Basil, Hirokun, Lightmouse, MBK004, Pennsy22, Addbot, Yobot, Tis the season to be jolly, PigFlu Oink, Trappist the monk, PhnomPencil, Llammakey and Anonymous: 9
- **USS Underwood (FFG-36)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Underwood\\_\(FFG-36\)?oldid=696322217](https://en.wikipedia.org/wiki/USS_Underwood_(FFG-36)?oldid=696322217) *Contributors:* Gdr, Bellhalla, Durin, ViriiK, SmackBot, Bluebot, Dual Freq, A. B., Sambot, STB-1, Beetstra, Haus, Cydebot, Sonar1313, Brad101, Einbierbitte, Sm8900, Jvedude, SGT141, Lightmouse, MBK004, Ktr101, Pennsy22, Life of Riley, Addbot, 1exec1, Nrpf22pr, FrescoBot, Trappist the monk, RjwilmsiBot, James.tiedeman and Anonymous: 12
- **USS Crommelin (FFG-37)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Crommelin\\_\(FFG-37\)?oldid=697421368](https://en.wikipedia.org/wiki/USS_Crommelin_(FFG-37)?oldid=697421368) *Contributors:* L-Bit, Wwoods, Aoi, Gdr, Malo, Harej, Bellhalla, Rjwilmsi, Durin, Awotter, ViriiK, The Rambling Man, Gaius Cornelius, Welsh, Jor70, SmackBot, Betacommand, Bluebot, Timneu22, A. B., Sambot, Esw01407, Nobunaga24, Beetstra, CmdrObot, Cydebot, Brad101, Buckshot06, Sm8900, CommonsDelinker, BrokenSphere, New Hampshireite, Jvedude, Hirokun, Ridernyc, SGT141, Falcon8765, Ffg37navigator, Lightmouse, Kumioko (renamed), MBK004, Sun Creator, Pennsy22, Life of Riley, Addbot, Yobot, 1exec1, Hornsfan37, Nrpf22pr, Erik9bot, PigFlu Oink, Lotje, DSkauai, Khazar2, Mogism, Russ Griffith, WPGA2345, Monkbot, Llammakey and Anonymous: 13
- **USS Curts (FFG-38)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Curts\\_\(FFG-38\)?oldid=697556793](https://en.wikipedia.org/wiki/USS_Curts_(FFG-38)?oldid=697556793) *Contributors:* Gdr, Bellhalla, Scriberius, ViriiK, MikeyChalupa, Wavelength, RussBot, SmackBot, Cla68, Hmains, Bluebot, TheFeds, Dual Freq, A. B., Sambot, STB-1, Beetstra, Haus, Cydebot, Nick Number, Marcd30319, New Hampshireite, Jvedude, SGT141, BarraganAP, Lightmouse, Maralia, MBK004, Arjayay, Pennsy22, Common Good, Addbot, Yobot, Mackin90, AnomieBOT, 1exec1, Nrpf22pr, Openskye, Safiel, Jschnur, Trappist the monk, 777sms, SporkBot, America789, Secondhand Work, Llammakey, Luis Santos24 and Anonymous: 18
- **USS Doyle (FFG-39)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Doyle\\_\(FFG-39\)?oldid=697268534](https://en.wikipedia.org/wiki/USS_Doyle_(FFG-39)?oldid=697268534) *Contributors:* The Epopi, Jdlh, David Newton, Wik, ZekeMacNeil, Gdr, Arvis21, Porges, Malo, Harej, Richard Arthur Norton (1958- ), Bellhalla, Marudubshinki, WB2, ViriiK, RussBot, Gse1.woody, Bluebot, TheFeds, Florian Adler, Dual Freq, A. B., Ohconfucius, Sambot, STB-1, Beetstra, Saxbry, Stormwalker628, Haus, Jowan2005, Cydebot, Brad101, Lightmouse, MBK004, Pennsy22, Addbot, Yobot, Brad101AWB, FrescoBot, Trappist the monk, Llammakey, Brainiac15 and Anonymous: 6
- **USS Halyburton (FFG-40)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Halyburton\\_\(FFG-40\)?oldid=697545193](https://en.wikipedia.org/wiki/USS_Halyburton_(FFG-40)?oldid=697545193) *Contributors:* Jinian, Wmillward, Roy Jaruk, Wwoods, BigBen212, Arvis21, Huntster, A2Kafir, Alai, Hojimachong, Woohookitty, Bellhalla, ViriiK, RussBot, Wiki alf, Hux, Tobias Schmidbauer, Martylunsford, Florian Adler, Dual Freq, A. B., AP1787, Escott, Pen of bushido, Sambot, STB-1, Beetstra, Haus, Rwfiammang, Cydebot, Gogo Dodo, TenthEagle, Evogol, Trident13, Brad101, LionFlyer, Albany NY, Marcd30319, Jvedude, XavierGreen, SGT141, Greswik, Low Radiation, Lightmouse, WacoJacko, Alsjr18, Blackcrowned, MBK004, Torsodog, Pennsy22, Addbot, Toyokuni3, Lightbot, Zorrobot, 1exec1, Trappist the monk, RjwilmsiBot, ClueBot NG, BTRand1, Monkbot, Skyrover, Llammakey, Militibus Memoria and Anonymous: 29
- **USS McClusky (FFG-41)** *Source:* [https://en.wikipedia.org/wiki/USS\\_McClusky\\_\(FFG-41\)?oldid=698289499](https://en.wikipedia.org/wiki/USS_McClusky_(FFG-41)?oldid=698289499) *Contributors:* Wwoods, Javidan, RJFJR, Bellhalla, Kzollman, Durin, ViriiK, RussBot, Wiki alf, SmackBot, Florian Adler, Dual Freq, A. B., Sambot, STB-1, Beetstra, Haus, Harej bot, Cydebot, Brad101, Magioladitis, Buckshot06, KConWiki, Sm8900, Marcd30319, Jvedude, VolkovBot, SGT141, Cobatfor, Lightmouse, MBK004, Pennsy22, Life of Riley, Addbot, Lightbot, Mackin90, 1exec1, FrescoBot, I dream of horses, Plasticspork, Trappist the monk, John of Reading, Amrokrian, Phd8511, Donald9307, America789, Russ Griffith, WPGA2345, Austin M. Williams, 95383z28, KNISHAM23 and Anonymous: 16
- **USS Klakring (FFG-42)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Klakring\\_\(FFG-42\)?oldid=699092649](https://en.wikipedia.org/wiki/USS_Klakring_(FFG-42)?oldid=699092649) *Contributors:* Timrollpicking, Wwoods, Klemen Kocjancic, Huntster, A2Kafir, Alai, Bellhalla, ^demon, ViriiK, Bgwhite, RussBot, Wiki alf, Cla68, A. B., Sambot, STB-1, Beetstra, Haus, Supersquid, Harej bot, Cydebot, Marcd30319, Jvedude, SGT141, SpartanPhalanx8588, Lightmouse, CaptSquid, JL-Bot, MBK004, ClueBot, Plasticspork, Pennsy22, Life of Riley, Addbot, Lightbot, Mackin90, 1exec1, FrescoBot, Trappist the monk, Kamran the Great, Dewritech, Duanedonecker, Cyberbot II, JediCouncilMemberScooter, James.tiedeman, Monkbot, Llammakey and Anonymous: 13
- **USS Thach (FFG-43)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Thach\\_\(FFG-43\)?oldid=698308251](https://en.wikipedia.org/wiki/USS_Thach_(FFG-43)?oldid=698308251) *Contributors:* Wwoods, Quadell, Arvis21, Bellhalla, ViriiK, RussBot, Wiki alf, Garion96, Chris the speller, Dual Freq, A. B., Sambot, STB-1, Beetstra, Digitalblister, MrDolomite, Kevin W., Haus, Harej bot, Cydebot, Brad101, DulcetTone, Dawkeye, Buckshot06, Chrisweuve, Marcd30319, Jvedude, SGT141, Lightmouse, MBK004, Pennsy22, Life of Riley, Jncraton, Ironholds, Lightbot, Mackin90, 1exec1, FrescoBot, Trappist the monk, EmusaBot, Intothatdarkness, Thewolfchild, Bakerbrett, Russ Griffith, WPGA2345, Monkbot, Llammakey and Anonymous: 17
- **USS De Wert (FFG-45)** *Source:* [https://en.wikipedia.org/wiki/USS\\_De\\_Wert\\_\(FFG-45\)?oldid=698311058](https://en.wikipedia.org/wiki/USS_De_Wert_(FFG-45)?oldid=698311058) *Contributors:* Jinian, Alan Liefting, Wwoods, Arvis21, A2Kafir, Harej, Alai, Bellhalla, XLerate, ViriiK, MikeyChalupa, Bgwhite, Ravenswing, RussBot, Wiki alf,

UniReb, TheFeds, A. B., Khoikhoi, Pen of bushido, Sambot, STB-1, Jmozena, Beetstra, Haus, Cydebot, Brad101, KomandorskiMaru, LionFlyer, Buckshot06, Marcd30319, Jvcdude, SGT141, Cobatfor, Lightmouse, Sfan00 IMG, MBK004, Pennsy22, Addbot, Morriswa, Yobot, 1exec1, Flewis, Sgmclare, HRoestBot, DocYako, Emroseman, 16jsul, Coolkirk1701, Llammakey and Anonymous: 14

- **USS Rentz (FFG-46)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Rentz\\_\(FFG-46\)?oldid=698312944](https://en.wikipedia.org/wiki/USS_Rentz_(FFG-46)?oldid=698312944) *Contributors:* Topbanana, Wwoods, No Guru, Arvis21, Bender235, A2Kafir, Alai, CruiserBob, Bellhalla, ViriiK, RussBot, Closedmouth, SmackBot, Cla68, Dual Freq, A. B., Egsan Bacon, Quartermaster, Appletnc, JzG, Sambot, Beetstra, Haus, Harej bot, Cydebot, Brad101, Miller17CU94, LionFlyer, Marcd30319, Drummer880, Jvcdude, Hirokun, SGT141, Lightmouse, AgentBauer535, MBK004, Pennsy22, Anticipation of a New Lover's Arrival, The, Addbot, Lightbot, Yobot, Mackin90, 1exec1, Openskye, Eagle4000, BlurescueARFF, Trappist the monk, Usige beatha, Kamran the Great, Jhooper4, Illegitimate Barrister, Alphacatmarnie, Russ Griffith, Car975, WPGA2345, Xdroneyz, F0rteOC and Anonymous: 14
- **USS Nicholas (FFG-47)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Nicholas\\_\(FFG-47\)?oldid=700493301](https://en.wikipedia.org/wiki/USS_Nicholas_(FFG-47)?oldid=700493301) *Contributors:* David Newton, WhisperToMe, Wwoods, Huntster, A2Kafir, Alai, Bellhalla, Jeff3000, Bluemoose, Kralizec!, ViriiK, SmackBot, Cla68, Daysleep47, Jprg1966, Colonies Chris, Florian Adler, A. B., Quartermaster, Ohconfucius, Sambot, Beetstra, Haus, BeenAroundAWhile, Harej bot, Cydebot, Brad101, Pustelnik, DagosNavy, RP88, Charles Edward, Ultraviolet scissor flame, Marcd30319, Jvcdude, Panzertank, Moorehal, Mtdhryk~enwiki, SGT141, Lightmouse, Maralia, MBK004, Pennsy22, Addbot, Fraggie81, 1exec1, E2eamon, Openskye, FrescoBot, Trappist the monk, A2z1964444, RjwilmsiBot, Hajatvrc, Michael Esmeyer, SporkBot, ClueBot NG, Antiqueight, ForwardObserver85, Khazar2, Vanquisher.UA, BRAVOGOLFTANGO, Llammakey and Anonymous: 27
- **USS Vandegrift (FFG-48)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Vandegrift\\_\(FFG-48\)?oldid=700660326](https://en.wikipedia.org/wiki/USS_Vandegrift_(FFG-48)?oldid=700660326) *Contributors:* Stan Shebs, David Newton, Chl, GreatWhiteNortherner, Wwoods, Gdr, LHOON, Huntster, Malo, Javidan, Woohookitty, Bellhalla, Jacobolus, Kzollman, ViriiK, Bgwhite, RussBot, Wiki alf, AJHalliwell, Davemck, SunKing, SmackBot, Jfurr1981, Jab843, Florian Adler, Dual Freq, A. B., Airwolf, Ohconfucius, Sambot, Beetstra, Haus, Harej bot, Cydebot, PalawanOz, Magioladitis, Buckshot06, CommonsDelinker, Marcd30319, Jvcdude, Hirokun, SGT141, OberRanks, Cobatfor, Lightmouse, MBK004, Pennsy22, Addbot, Tencv, Chamal N, Lightbot, Yobot, Mackin90, LilHelpa, Openskye, Brad101AWB, RightCowLeftCoast, FrescoBot, Eebriggs, Trappist the monk, Mztourist, Will Beback Auto, ClueBot NG, Wyllys, KMJKWhite, Russ Griffith and Anonymous: 35
- **USS Robert G. Bradley (FFG-49)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Robert\\_G.\\_Bradley\\_\(FFG-49\)?oldid=698479935](https://en.wikipedia.org/wiki/USS_Robert_G._Bradley_(FFG-49)?oldid=698479935) *Contributors:* Wwoods, Arvis21, A2Kafir, Alai, Bellhalla, ViriiK, RussBot, Wiki alf, SmackBot, Dual Freq, A. B., Sambot, STB-1, Beetstra, Haus, Fvasconcellos, Harej bot, Cydebot, Brad101, KTo288, Wilsbadkarma, Jvcdude, SGT141, Texansfan07, Falcon8765, Lightmouse, MBK004, Blanchardb, Pennsy22, Addbot, Jackdandy, Yobot, 1exec1, Trappist the monk, WPGA2345 and Anonymous: 17
- **USS Taylor (FFG-50)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Taylor\\_\(FFG-50\)?oldid=698482314](https://en.wikipedia.org/wiki/USS_Taylor_(FFG-50)?oldid=698482314) *Contributors:* Wwoods, Thuresson, A2Kafir, Gene Nygaard, Alai, Woohookitty, Bellhalla, Fche, Rjwilmsi, ViriiK, Jwainki, RussBot, Wiki alf, Cla68, Florian Adler, Dual Freq, A. B., Swat671, Sambot, STB-1, Beetstra, Haus, Harej bot, Cydebot, Gogo Dodo, Brad101, Grishnackh, Wilsbadkarma, Jvcdude, SGT141, Cobatfor, Lightmouse, MBK004, Pennsy22, Addbot, Morriswa, Nohomers48, Yobot, 1exec1, FrescoBot, Trappist the monk, RjwilmsiBot, Donner60, Thewolfchild, Sonarchiefret, Phd8511, Froggie184, 220 of Borg, BattyBot, WPGA2345 and Anonymous: 19
- **USS Gary (FFG-51)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Gary\\_\(FFG-51\)?oldid=698811672](https://en.wikipedia.org/wiki/USS_Gary_(FFG-51)?oldid=698811672) *Contributors:* The Epopt, Jinian, Wwoods, Huntster, A2Kafir, Richard Harvey, Harej, Gene Nygaard, Alai, Woohookitty, Bellhalla, Kralizec!, BD2412, Durin, Nonsequiturmine, ViriiK, RussBot, Wiki alf, Welsh, Dual Freq, A. B., Sambot, STB-1, Beetstra, Wikited, Haus, Senorelrobot, Cydebot, Mo-markshirley, Brad101, Saruwine, Hulces, Rich153fish, Marcd30319, Jvcdude, SGT141, Dannyboyum, Cobatfor, Editore99, Rhk111, Lightmouse, MBK004, Sun Creator, Pennsy22, Addbot, Morriswa, Nohomers48, Yobot, Mackin90, 1exec1, Materialscientist, Safiel, FrescoBot, Trappist the monk, Kamran the Great, Thewolfchild, BG19bot, DSkauai, MaxEddi, ChrisGualtieri, Khazar2, Mogism, Russ Griffith, NorthBySouthBaranof, Kahtar, Llammakey, Courtney Canizares and Anonymous: 18
- **USS Carr (FFG-52)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Carr\\_\(FFG-52\)?oldid=700624740](https://en.wikipedia.org/wiki/USS_Carr_(FFG-52)?oldid=700624740) *Contributors:* Jinian, Wwoods, Arvis21, RushMeister, A2Kafir, Harej, Alai, Bellhalla, ViriiK, RussBot, Wiki alf, SmackBot, TheFeds, A. B., Ohconfucius, Sambot, Beetstra, PRRfan, Haus, Xformed, Cydebot, Khatru2, Phsikes@hotmail.com, Brad101, Mattsrevenge, Hcob, Parsecboy, R'n'B, Marcd30319, Jvcdude, Hirokun, TXiKiBoT, SGT141, Falcon8765, Lightmouse, Kumioko (renamed), MBK004, Mgeason, Pennsy22, Life of Riley, Addbot, Lightbot, Yobot, AnomieBOT, FrescoBot, Trappist the monk, Starcheerspeaknewslostwars, Illegitimate Barrister, SporkBot, BattyBot, Cerabot~enwiki, Mckalav, Llammakey and Anonymous: 11
- **USS Hawes (FFG-53)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Hawes\\_\(FFG-53\)?oldid=698796308](https://en.wikipedia.org/wiki/USS_Hawes_(FFG-53)?oldid=698796308) *Contributors:* The Epopt, David Newton, Wwoods, Bobblewik, Gdr, N328KF, A2Kafir, Malo, Harej, Alai, Bellhalla, DePiep, Benpierce, ViriiK, RussBot, Wiki alf, Erhardt, Florian Adler, A. B., Ohconfucius, Sambot, STB-1, Beetstra, Haus, Supersquid, Cydebot, Brad101, Wilsbadkarma, Jvcdude, EricSerge, Lightmouse, MBK004, Pennsy22, Lightbot, Legobot, Yobot, Eumolpo, Brad101AWB, Николай Путин, Captain Cheeks, FrescoBot, Andre Kritzinger, Trappist the monk, Lurch9884, SporkBot, USS Iowa freack, BG19bot and Anonymous: 14
- **USS Ford (FFG-54)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Ford\\_\(FFG-54\)?oldid=700493540](https://en.wikipedia.org/wiki/USS_Ford_(FFG-54)?oldid=700493540) *Contributors:* Wwoods, JoeSmack, A2Kafir, Malo, Harej, Alai, Bellhalla, FlaBot, MikeyChalupa, RussBot, Wiki alf, SmackBot, Jls0000, Jprg1966, Dual Freq, A. B., Sambot, STB-1, Beetstra, Cydebot, Brad101, Dawkeye, Luna Santin, Barek, Buckshot06, BilCat, Sm8900, Marcd30319, Yoctownyocol, Jvcdude, Hammersoft, SGT141, Lightmouse, MBK004, Pennsy22, Life of Riley, Addbot, M.nelson, Lightbot, Mackin90, 1exec1, FrescoBot, HRoestBot, John of Reading, ChuispastonBot, Makecat-bot, Russ Griffith, WPGA2345, Monkbot, The Quixotic Potato and Anonymous: 19
- **USS Elrod (FFG-55)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Elrod\\_\(FFG-55\)?oldid=699173943](https://en.wikipedia.org/wiki/USS_Elrod_(FFG-55)?oldid=699173943) *Contributors:* Wwoods, ConradPino, Out180, Javidan, Harej, Woohookitty, Bellhalla, TomTheHand, Grammarbot, Durin, Gparker, RussBot, SmackBot, Chris the speller, TheFeds, Ohconfucius, Sambot, STB-1, Beetstra, Cydebot, Brad101, Sm8900, R'n'B, Marcd30319, SGT141, Koalorka, Cobatfor, Lightmouse, MBK004, Amsmythe, Pennsy22, Life of Riley, Addbot, Lightbot, 1exec1, Materialscientist, FrescoBot, Zorin09, Trappist the monk, Kamran the Great, Wikifreund, Donner60, Joseph R. Etheridge III, Elrodsailor1234 and Anonymous: 14
- **USS Simpson (FFG-56)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Simpson\\_\(FFG-56\)?oldid=700193185](https://en.wikipedia.org/wiki/USS_Simpson_(FFG-56)?oldid=700193185) *Contributors:* Jinian, Mervyn, Wwoods, Lestatdelc, Gdr, Canterbury Tail, N328KF, Discospinster, Phoenix Hacker, Triona, Ryanmedaniel, Malo, Bellhalla, TomTheHand, Rjwilmsi, Durin, Russavia, Victor12, Cornellrockey, Ravenswing, RussBot, Wiki alf, Pesco, Matt Heard, SmackBot, Dual Freq, A. B., Rlevse, Khukri, Ohconfucius, Will Beback, Sambot, STB-1, Nobunaga24, Beetstra, Anonymous anonymous, ScreaminEagle, J Di, Supersquid, Bigfred105, Harej bot, MarsRover, NE Ent, Cydebot, Gogo Dodo, Sworah, Brad101, Paluronsat, Bobblehead, Harvardlaw, Konman72, Raitchison, HolyT, MER-C, Hut 8.5, Buckshot06, Nyttend, Sm8900, Wilsbadkarma, Littleghostboo, New Hampshireite, Scarrgo, Nigel Ish, XavierGreen, Obafgkm, SGT141, Grahamboat, Koalorka, Ccbond, Cobatfor, Lightmouse, MBK004, Ktr101,

Pennsy22, Jtiedeman, Fish007cia, Addbot, Lightbot, Yobot, AnomieBOT, 1exec1, Safiel, FrescoBot, Trappist the monk, Illegitimate Barrister, BG19bot, Phd8511, ChrisGualtieri, Robertjamesftw, James.tiedeman, Monkbot, Chinook5571, ♥Golf and Anonymous: 67

- **USS Reuben James (FFG-57)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Reuben\\_James\\_\(FFG-57\)?oldid=699426008](https://en.wikipedia.org/wiki/USS_Reuben_James_(FFG-57)?oldid=699426008) *Contributors:* The Epopt, David Newton, Wwoods, Bobblewik, Tagishsimon, Gdr, N328KF, Travisyoun, Ravenhull, Bellhalla, Rjwilmsi, Isaac Rabivitch, Wegngis, RussBot, 71Demon, Brad Rousse, Bullseye, Wiki alf, Odemars, Phichanad, Nick-D, Dual Freq, A. B., MJCdetroit, Airwolf, Ohconfucius, Sambot, STB-1, Simongraham, Brent williams, Beetstra, MrDolomite, Haus, Dkastner, HDCase, CmdrObot, Harej bot, Cydebot, Paddles, Brad101, Arch dude, Buckshot06, Sm8900, CommonsDelinker, New Hampshireite, Jvcdude, Kyriosity, SGT141, AlleborgoBot, Lightmouse, MBK004, Ktr101, PixelBot, C628, Pennsy22, Addbot, Lightbot, Yobot, AnomieBOT, 1exec1, FrescoBot, Trappist the monk, RjwilmsiBot, Illegitimate Barrister, H3llBot, HammerFilmFan, Navyjer, ClueBot NG, Alphacatmarnie, DBigXray, Phd8511, Bobeldridge, Edthed, Japanese boy, Russ Griffith, DD4235, Jbon1931 and Anonymous: 27
- **USS Samuel B. Roberts (FFG-58)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Samuel\\_B.\\_Roberts\\_\(FFG-58\)?oldid=699434052](https://en.wikipedia.org/wiki/USS_Samuel_B._Roberts_(FFG-58)?oldid=699434052) *Contributors:* Jinian, PaulinSaudi, David Newton, YanA, Wwoods, Niteowlneils, Iceberg3k, Bobblewik, Gdr, Bbpent, Klemen Kocjancic, Mtnerd, N328KF, Sietse Snel, Jpgordon, MarkHab, Joshbaumgartner, Phyllis1753, Gene Nygaard, Fdewael, Bellhalla, Rjwilmsi, Ligulem, Russavia, RussBot, Izambardprince, Wiki alf, Nick-D, That Guy, From That Show!, SmackBot, Finavon, Cla68, GoldDragon, Florian Adler, Dual Freq, A. B., Ohconfucius, Sambot, STB-1, Beetstra, Publicus, PRRfan, Big Blue Marble, Rhebus, Haus, Orthographer, Armandd, Harej bot, Cydebot, Tec15, Nabokov, Brad101, Aldis90, EarthPerson, Arch dude, Albany NY, BilCat, Sm8900, JoDonHo, Veriss1, Lurkercowboy, Cometstyles, Jvcdude, Hugo999, HJ32, SGT141, Cobatfor, Wachholder, Benea, Lightmouse, MBK004, Stefanomenecarrelli, Jfdavis668, Pennsy22, DumZiBot, Life of Riley, Addbot, Chamal N, Delta 51, Yobot, KirkCliff2, Citation bot, Anon423, Der rikkk, AstaBOTh15, Trappist the monk, DexDor, Wikipelli, Thewolfchild, Sharkmouth, Helpful Pixie Bot, Brute nm, CitationCleanerBot, Ratmandu, Dexbot, Jamesx12345, Nguyen QuocTrung, WPGA2345, Monkbot, KasparBot and Anonymous: 35
- **USS Kauffman (FFG-59)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Kauffman\\_\(FFG-59\)?oldid=699445461](https://en.wikipedia.org/wiki/USS_Kauffman_(FFG-59)?oldid=699445461) *Contributors:* Wwoods, A2Kafir, Harej, Alai, Bellhalla, Mizzou1307, Bgwhite, RussBot, Wiki alf, SmackBot, Dual Freq, A. B., OrphanBot, Ohconfucius, STB-1, Beetstra, Haus, Cydebot, Brad101, Tarendipitous, Sm8900, Marcd30319, Mpdalyst6, Jvcdude, SGT141, Falcon8765, Spitfire8520, Cobatfor, Lightmouse, Mojoworker, MBK004, Carrarchdale, Pennsy22, Life of Riley, Addbot, Lightbot, Yobot, Sprachpfleger, Fastbean, Le Deluge, FrescoBot, Trappist the monk, John of Reading, Thesecretaryofwar, Illegitimate Barrister, BG19bot, Cyberbot II, Gilpin12345, Comatmebro, Edman209 and Anonymous: 17
- **USS Rodney M. Davis (FFG-60)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Rodney\\_M.\\_Davis\\_\(FFG-60\)?oldid=699591403](https://en.wikipedia.org/wiki/USS_Rodney_M._Davis_(FFG-60)?oldid=699591403) *Contributors:* Wwoods, Leonard G., JoeSmack, A2Kafir, Alai, Bellhalla, Bgwhite, RussBot, Wiki alf, SmackBot, Dual Freq, A. B., Quartermaster, OrphanBot, STB-1, Beetstra, Iridescent, Harej bot, Cydebot, Brad101, Dawkeye, Barek, Buckshot06, Sm8900, Psychardis, Wilsbadkarma, Marcd30319, New Hampshireite, Jvcdude, XavierGreen, SGT141, Chris826, Cobatfor, Lightmouse, MBK004, ClueBot, Pennsy22, DumZiBot, Addbot, Kman543210, Lightbot, Luckas-bot, Yobot, 1exec1, FrescoBot, Telarium, Illegitimate Barrister, Tdaynes, SporkBot, Monkbot, Modulus12 and Anonymous: 34
- **USS Ingraham (FFG-61)** *Source:* [https://en.wikipedia.org/wiki/USS\\_Ingraham\\_\(FFG-61\)?oldid=700251534](https://en.wikipedia.org/wiki/USS_Ingraham_(FFG-61)?oldid=700251534) *Contributors:* Jinian, Raven in Orbit, Mustang dvs, Merovingian, Wwoods, Ray Trygstad, JoeSmack, A2Kafir, Harej, Alai, Johntex, Bellhalla, Kralizec!, RussBot, Wiki alf, Albyva, SmackBot, Jls0000, Chris the speller, Florian Adler, Dual Freq, A. B., Sambot, STB-1, Accurizer, Beetstra, Supersquid, Cydebot, Brad101, Mutiny, Einbierbitte, Dawnseeker2000, Barek, OhanaUnited, Buckshot06, Sm8900, Marcd30319, Jvcdude, Egotism, SGT141, Falcon8765, Koalorka, Spitfire8520, Ketone16, Lightmouse, MBK004, Pennsy22, Life of Riley, Addbot, Lightbot, Wigglepuppy2012, 1exec1, Gsmgm, J appleseed2, FrescoBot, Plasticspork, Trappist the monk, John of Reading, H3llBot, Cyberbot II, Russ Griffith, Monkbot, Llammakey, Austin M. Williams, The Quixotic Potato and Anonymous: 25
- **Adelaide-class frigate** *Source:* [https://en.wikipedia.org/wiki/Adelaide-class\\_frigate?oldid=698049741](https://en.wikipedia.org/wiki/Adelaide-class_frigate?oldid=698049741) *Contributors:* Rmhermen, Hammersfan, Klemen Kocjancic, ESkog, Joshbaumgartner, Bellhalla, TomTheHand, Rjwilmsi, Wongm, Bgwhite, Saberwyn, Alureiter, Nick-D, SmackBot, Bluebot, Dual Freq, A. B., Derekbridges, Open-box, OrphanBot, Ala.foum, Ohconfucius, JohnI, Beetstra, Politepunk, Haus, MarsRover, Cydebot, Peripitus, Thijs!bot, Oldwildbill, HolyT, DagosNavy, Honsou Eshara, TAnthony, Elizabethreed, DH85868993, Oldag07, Lightmouse, Fratrep, Weemanorpope, MBK004, PipepBot, Pharknuckle, Blacksupernova, Canberra photographer, DumZiBot, Addbot, ContiAWB, Lightbot, Delta 51, Luckas-bot, Citation bot, ArthurBot, GrouchoBot, Armbrust, Anotherclown, RedBot, Lupusj, Trappist the monk, RjwilmsiBot, DASHBot, Mztourist, Pahazzard, ZéroBot, H3llBot, ChuispastonBot, ClueBot NG, MoondyneAWB, Helpful Pixie Bot, BattyBot, Garamond Lethe, LordHello1, BlueworldSpeccie, Ceannlann gorm, F4fvs and Anonymous: 39
- **HMAS Adelaide (FFG 01)** *Source:* [https://en.wikipedia.org/wiki/HMAS\\_Adelaide\\_\(FFG\\_01\)?oldid=700220548](https://en.wikipedia.org/wiki/HMAS_Adelaide_(FFG_01)?oldid=700220548) *Contributors:* Bryan Derksen, The Tom, Moondyne, Everyking, Hammersfan, Brianhe, SpookyMulder, Circeus, Joshbaumgartner, Nightstallion, Bellhalla, TomTheHand, Montblanc05, Kbdank71, Kaseyduchty, RussBot, Desparoz, Gaius Cornelius, Saberwyn, Nick-D, Attilios, Declare, Bluebot, Hossen27, Dual Freq, A. B., Derekbridges, OrphanBot, Wilfred Pau, Salamurai, Sambot, Greentubing, Qwertytam, Beetstra, CmdrObot, Cydebot, Peripitus, Oldwildbill, Sizuru-enwiki, Kohai-enwiki, The Anomebot2, Elizabethreed, Ajayius, Mbashaw, STBotD, DH85868993, WereSpielChequers, Lightmouse, ImageRemovalBot, MBK004, Bob1960events, Mild Bill Hiccup, Manishearth, Colejs01, Socrates2008, BrettFairbairn, Shred-69, Kbdankbot, Addbot, NjardarBot, Lightbot, Zorrobot, The Bushranger, StraSSenBahn, Yobot, AnomieBOT, Whodidwhat, Ruodyssey, Anotherclown, AustralianRupert, Thehelpfulbot, Yellow wiggle, Trappist the monk, RjwilmsiBot, ZéroBot, Nikster10, ClueBot NG, Helpful Pixie Bot, Darknight123456, Cowdy001, Dells-93 and Anonymous: 25
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IMG, MBK004, 718 Bot, Blacksupernova, Kbdankbot, Addbot, Download, Tide rolls, Lightbot, The Bushranger, Yobot, AnomieBOT, SPStech, Anotherclown, FrescoBot, Surv1v4l1st, Boat warrior92, RedKnight 1, Trappist the monk, Merno1976, H3llBot, Pertuan, Helpful Pixie Bot, Blacksnow1, YFdyh-bot, Nguyen QuocTrung, Icensnow42, Monkbot, Dunno2014, LordHello1, MatthewD27 and Anonymous: 16

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- **Spanish frigate Victoria (F82)** *Source:* [https://en.wikipedia.org/wiki/Spanish\\_frigate\\_Victoria\\_\(F82\)?oldid=699311932](https://en.wikipedia.org/wiki/Spanish_frigate_Victoria_(F82)?oldid=699311932) *Contributors:* Rich.Farmbrough, Bellhalla, GregorB, 25~enwiki, Victor12, Mare, Odemars, SmackBot, Zaqrabal, Chris.the.speller, Dual.Freq, Ohconfucius, Park3r, Cydebot, RelentlessRecusant, Evogol, Brad101, Dawkeye, Lahoun, VolkovBot, TXiKiBoT, MBK004, Kbdankbot, Addbot, Lightbot, Takashi.kurita, Yobot, AnomieBOT, I.dream.of.horses, Rlmbdg, Trappist.the.monk, WikitanvirBot, Dewritech, Cyberbot.II, ÄDA - DÄP, Monkbot, Llammakey and Anonymous: 6

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- **ROCS Chang Chien (FFG-1109)** *Source:* [https://en.wikipedia.org/wiki/ROCS\\_Chang\\_Chien\\_\(FFG-1109\)?oldid=687754590](https://en.wikipedia.org/wiki/ROCS_Chang_Chien_(FFG-1109)?oldid=687754590) *Contributors:* Loren36, Malo, Bellhalla, TomTheHand, Will74205, Daduzi, Mare, SmackBot, Dual Freq, Nakon, Drinibot, Cydebot, Nigel Ish, Lightmouse, MBK004, SchreiberBike, Trappist the monk, ÄDA - DÄP, Monkbot, Llammakey and Anonymous: 3
- **ROCS Tian Dan (FFG-1110)** *Source:* [https://en.wikipedia.org/wiki/ROCS\\_Tian\\_Dan\\_\(FFG-1110\)?oldid=687762752](https://en.wikipedia.org/wiki/ROCS_Tian_Dan_(FFG-1110)?oldid=687762752) *Contributors:* Mr Bound, Bellhalla, TomTheHand, Will74205, CobaltBurrito, Drinibot, Cydebot, Philg88, Benea, Lightmouse, MBK004, Sunquanliangxiuhao, Benjamin Trovato, Chongkian, Trappist the monk, Bryan TMF, Lieutenant of Melkor, Monkbot, Cckkhedc and Anonymous: 1
- **Hsiung Feng II** *Source:* [https://en.wikipedia.org/wiki/Hsiung\\_Feng\\_II?oldid=688233526](https://en.wikipedia.org/wiki/Hsiung_Feng_II?oldid=688233526) *Contributors:* Sam Hocevar, Loren36, Cmdr-jameson, BD2412, Arado, John Smith's, Robertvan1, Sardanaphalus, SmackBot, Chris the speller, Open-box, Jumping cheese, Vina-iwbot-enwiki, RomanSpa, WinBot, Gbrucegolden, K kc chan, Chaosdruid, BryanC TMF, Addbot, Yobot, ArthurBot, Bryan TMF, Midas02, America789, SomeFreakOnTheInternet, Hampton11235 and Anonymous: 11
- **ORP General Tadeusz Kościuszko** *Source:* [https://en.wikipedia.org/wiki/ORP\\_Genera%C5%82\\_Tadeusz\\_Ko%C5%9Bciuszko?oldid=685276259](https://en.wikipedia.org/wiki/ORP_Genera%C5%82_Tadeusz_Ko%C5%9Bciuszko?oldid=685276259) *Contributors:* Akumiszcka, Halibutt, Radomil, Katarzyna, Bobblewik, Balcer, Bellhalla, Gaius Cornelius, Odemars, De Administrando Imperio, Nick-D, Gilliam, Bluebot, Fuhghettaboutit, Airwolf, Sambot, Haus, Cydebot, Aldis90, Bd64kemo, Kato2k6, PMG, Mateusz War., Nihil novi, Lightmouse, ImageRemovalBot, Bandurr, DumZiBoT, Good Olfactory, Addbot, Lightbot, GrouchoBot, Lothar von Richthofen, Fry1989, EmausBot, ZéroBot, ÄDA - DÄP, Monkbot, Llammakey, Luis Santos24 and Anonymous: 4
- **ORP General Kazimierz Pułaski** *Source:* [https://en.wikipedia.org/wiki/ORP\\_Genera%C5%82\\_Kazimierz\\_Pu%C5%82aski?oldid=685276255](https://en.wikipedia.org/wiki/ORP_Genera%C5%82_Kazimierz_Pu%C5%82aski?oldid=685276255) *Contributors:* Pibwl, Halibutt, Radomil, Katarzyna, Bobblewik, Piotrus, Emax, Balcer, Bellhalla, Marshemb, Gaius Cornelius, Curpsbot-unicodify, OrphanBot, Copysan, Airwolf, Sambot, Cydebot, Aldis90, Grzegorz Dąbrowski, Lightmouse, Sfan00 IMG, Shem1805, DumZiBoT, Addbot, Lightbot, Yobot, Lothar von Richthofen, Fry1989, Helpful Pixie Bot, Monkbot and Anonymous: 3

- **RBNS Sabha (FFG-90)** *Source:* [https://en.wikipedia.org/wiki/RBNS\\_Sabha\\_\(FFG-90\)?oldid=687951449](https://en.wikipedia.org/wiki/RBNS_Sabha_(FFG-90)?oldid=687951449) *Contributors:* Rmhermen, Brianhe, MBisanz, Pearle, Bellhalla, Metropolitan90, MidgleyDJ, Derekbridges, Ser Amantio di Nicolao, Haus, MarsRover, Cydebot, Alikaaalex, BrokenSphere, HolyHead, EricSerge, MBK004, Rehman, Mgoude, LilHelpa, Trappist the monk, John of Reading, Monkbot and Anonymous: 2
- **Bath Iron Works** *Source:* [https://en.wikipedia.org/wiki/Bath\\_Iron\\_Works?oldid=695036502](https://en.wikipedia.org/wiki/Bath_Iron_Works?oldid=695036502) *Contributors:* The Epopt, Jinian, Michael Hardy, Notheruser, Robbot, Decumanus, NightThree, Wwoods, Iceberg3k, Bbpenn, Donan.raven, D6, N328KF, Rich Farmbrough, Rje, PaulHanson, Joshbaumgartner, Gulfstorm75, Pjmorse, Kurieeto, Woohookitty, Bellhalla, Tim!, Valentinejoesmith, Boatman, XLerate, MLRoach, Cyberprog, Epipelagic, Albyva, SmackBot, Finavon, Gjs238, Florian Adler, Famspear, Derekbridges, Rhollenton, Jwillbur, Ligulembot, Publicus, PRRfan, Neddyseagoon, Haus, Octane, Namiba, HennessyC, ShelfSkewed, Thijs!bot, Sizuru~enwiki, Magioladitis, Flowanda, R'n'B, Wi101, Chiswick Chap, Nono le petit robot~enwiki, A4bot, SQL, SE7, Lightmouse, Maralia, Xnatedawgx, ImageRemovalBot, MBK004, Plastikspork, Masterblooregard, Ktr101, Excirial, Thewellman, Romney yw, Life of Riley, Julienman11, Cmr08, Addbot, Lightbot, Shannon1, Yobot, Ptbotgourou, Николай 98765, Citation bot, Mark Schierbecker, Full-date unlinking bot, Cnwiliams, Lotje, ZéroBot, \$1LENCE D00600D, Palaeozoic99, Sven Mangard, Sharkmouth, Helpful Pixie Bot, Calidum, CitationCleanerBot, WestportWiki, Hmainsbot1, Skimaine15, Peteramainer and Anonymous: 31
- **Vigor Shipyards** *Source:* [https://en.wikipedia.org/wiki/Vigor\\_Shipyards?oldid=691582915](https://en.wikipedia.org/wiki/Vigor_Shipyards?oldid=691582915) *Contributors:* Stan Shebs, Lukobe, Lou Sander, Scarequotes, D6, Hooperbloob, Ceyockey, Bobrayner, BD2412, Leithp, Bdelisle, Rayc, SmackBot, Chris the speller, McNeight, Dual Freq, Rhollenton, TPO-bot, Alabot, Thijs!bot, Sizuru~enwiki, Jim.henderson, Johnpacklambert, Tokyogirl79, Safemariner, Maralia, ImageRemovalBot, Auntnof6, Ktr101, Mtsmallwood, Thewellman, Life of Riley, XLinkBot, Wikiuser100, Addbot, Lightbot, Николай 98765, LostByTheSea, Argames, MastiBot, Trappist the monk, RjwilmsiBot, Gofigure41, Senator2029, DTParker1000, Grant Fosheim, Stephoram, DissidentAggressor, Ethelred unraed, JamesDonly, Airplane Maniac and Anonymous: 7
- **General Electric LM2500** *Source:* [https://en.wikipedia.org/wiki/General\\_Electric\\_LM2500?oldid=674430959](https://en.wikipedia.org/wiki/General_Electric_LM2500?oldid=674430959) *Contributors:* BlckKnght, Mcarling, Stan Shebs, SD6-Agent, TDC, Dj245, Bbpenn, N328KF, Brianhe, Duk, Gene Nygaard, Amire80, Arado, DanMS, Georgewilliamherbert, Alureiter, Dual Freq, Wybot, Iliev, Arnoha, Cacetudo, Fnlayson, PeterHewett, Aldis90, Thijs!bot, Rjmail, Rees11, BilCat, Akinkhoo, VolkovBot, Maxim, Tom MacPherson, Michaeldsuresz, Spinningspark, Enkyo2, Ariadacapo, Pakaraki, Niceguyedc, DragonBot, Piperonal, Addbot, LaaknorBot, Temren, Ariganello, Lightbot, AnomieBOT, Rubinbot, Cookiemonster70, Paska rotor, Brutaldeluxe, Gfha, Skcpublic, FrescoBot, LucienBOT, SH9002, HRoestBot, 777sms, TGCP, John of Reading, Kilon22, UI1-82-2, Shadowleaves, Aéronefs, c'est parfait!, Helpful Pixie Bot, Kendall-K1, Wfoj3, Pdackins and Anonymous: 38
- **Azimuth thruster** *Source:* [https://en.wikipedia.org/wiki/Azimuth\\_thruster?oldid=670346853](https://en.wikipedia.org/wiki/Azimuth_thruster?oldid=670346853) *Contributors:* Maximus Rex, Finlay McWalter, Securiger, Lproven, Humblefool, Master Of Ninja, Discospinster, Rich Farmbrough, Rama, Rackham, Viriditas, Foobaz, Hooperbloob, Abstraktn, Brosen~enwiki, Skyring, Kenyon, Jeff3000, Rjwilmsi, YurikBot, Ospalh, Petri Krohn, Alureiter, SmackBot, Marc Lacoste, Finavon, Durdenky, Hmains, Moshe Constantine Hassan Al-Silverburg, MJBurrage, Derek R Bullamore, Xtrememachineuk, Amtiss, DynamicDes, Joffeloff, Haus, CmdrObot, BoH, Van helsing, N2e, Islander(Scandinavia), Palmiped, Saarsaether, Thijs!bot, Jssfrk, Snowjam, Dulciana, Gasheadsteve, SmokeySteve, Potatoswatter, Atropos235, Jamesontai, VolkovBot, Tmolrecht, Dodger67, Wuhwuzzat, Sfan00 IMG, Ariadacapo, Artreve, Addbot, Jacopo Werther, Lightbot, Yobot, AnomieBOT, BritishWatcher, Wikiarius, FrescoBot, Tupsumato, Shatwelw, Kovako-1, Dewritech, Rgylden, ClueBot NG, Bideo, MerllwBot, J991, Bemmen, ChrisGualtieri, Boletis, IndulaSnicket, Schotteleranerin and Anonymous: 51
- **Variable-pitch propeller** *Source:* [https://en.wikipedia.org/wiki/Variable-pitch\\_propeller?oldid=699052635](https://en.wikipedia.org/wiki/Variable-pitch_propeller?oldid=699052635) *Contributors:* Maury Markowitz, Ronz, Denelson83, Vardion, Smyth, Pearle, Hooperbloob, Vellela, Tariqabjotu, Firsfron, GraemeLeggett, Ahunt, Hydrargyrum, Alureiter, SmackBot, KVDP, Yamaguchi 先生, Nzd, Chris the speller, Trephiler, The PIPE, Xtrememachineuk, JHunterJ, Beetsstra, JoeBot, Lahira k, CmdrObot, BoH, Ms1701, Gatoclass, SetiHitchHiker, Srajan01, Brad101, AndrewDressel, Dtgriscom, Shirt58, Magioladitis, MastCell, BilCat, Pinot, Arrivisto, Gwen Gale, Nuance 4, Thomas419ca, Suriel1981, Andy Dingley, Atomicbre, Aspects, Moletrouser, Firefly4342, Hamiltondaniel, Dolphin51, YSSYguy, Mild Bill Hiccup, Nimbus227, Battle Moose, XLinkBot, Airplaneman, Reedmalloy, Sharl928, Yobot, AnomieBOT, Ciphers, Onelegodude, Richard Ogley, Marshallallensmith, Jollyroger131, TheLongTone, DexDor, Jackehammond, TGCP, AvicAWB, BattyBot, Lugia2453, YiFeiBot, Topher92 and Anonymous: 47
- **Stabilizer (ship)** *Source:* [https://en.wikipedia.org/wiki/Stabilizer\\_\(ship\)?oldid=692928708](https://en.wikipedia.org/wiki/Stabilizer_(ship)?oldid=692928708) *Contributors:* Dj245, Pt, Dandv, Commander Keane, Rjwilmsi, Alywnna Kasmira, Malcolma, Epipelagic, Tim1965, Exit2DOS2000, Earthworm Makarov, Copeland.James.H, LarrymcP, Chetvorno, CmdrObot, Meaglin, Iviney, Nick Number, Deeplogic, Albany NY, Ekki01, VolkovBot, Subsea, Motacilla, Sammy0001, Dolphin51, Canglesea, Courtneypb3, Crowsnest, SilvonenBot, Addbot, Luckas-bot, RockfangBot, AnomieBOT, Printpost, Erik9bot, MastiBot, Itu, DexDor, Jackehammond, Zeusartworks, AvicAWB, Colapeninsula, Park Flier, Helpful Pixie Bot, Alphacatmarnie, BG19bot, Catlith, Khazar2, Dough34, Monkbot, SovalValtos, Baldmont and Anonymous: 16
- **Kaman SH-2 Seasprite** *Source:* [https://en.wikipedia.org/wiki/Kaman\\_SH-2\\_Seasprite?oldid=700419215](https://en.wikipedia.org/wiki/Kaman_SH-2_Seasprite?oldid=700419215) *Contributors:* Magnus Manske, Maury Markowitz, Arpingstone, Paul A, Ahoerstemeier, Rlandmann, Alvaro, Guaka, David Newton, Topbanana, Camerong, Greyengine5, Bobblewik, Ray Trygstad, Robert Brockway, Hammersfan, Blue387, Karl Dickman, Mtnerd, Trevor MacInnis, Rich Farmbrough, Guanabot, Stahlkocher1, Diceman, Pearle, SPUTI, Thatguy96, Jigen III, Evil Monkey, UPH~enwiki, Gene Nygaard, Dan100, Chris Buckley, LeoO3, BD2412, Kbdank71, Rogerd, Ian Pitchford, Gurch, MoRsE, RussBot, Hydrargyrum, Gaius Cornelius, Hawkeye7, Saberwyn, Mieciu K, Edwardaggie98, Mike Selinker, Winstonwolfe, Nick-D, SmackBot, Ross.browne, Chris the speller, Colputt, Dual Freq, SCD-Bob~enwiki, Hotspur23, MilborneOne, Corran.pl, Saxbry, Ken Gallager, Cydebot, Fnlayson, Carguychris, Lturner80, Thijs!bot, Carloseduardo~enwiki, Hamenw, Signaleer, Ingolfson, Askari Mark, Buckshot06, BlakJakNZ, BilCat, Sm8900, Interscan, Yar, VolkovBot, Cobra2492, GimmeBot, ANigg, AlleborgoBot, WRK, Cobatfor, Jvs, Fratrep, Groyal, Gderbysh, NiD.29, Alexbot, Noca2plus, PixelBot, Hilbertz, GPS73, XLinkBot, Ost316, Dave1185, Addbot, Nohomers48, LatitudeBot, ContiAWB, Lightbot, The Bushranger, Luckas-bot, Yobot, Reezerf, AnomieBOT, MCheer, Ulric1313, Nzseasprite, Navyflyboy73, Thehelpfulbot, Kyteto, Swbailey97128, Skyraider1, Love-travel86, RedBot, Julien1978, 777sms, Mztourist, John of Reading, AvicBot, ZéroBot, Feliciahorner, KazekageTR, Chesipiero, ColMilGem, Helpful Pixie Bot, Whytk, Jay8g, BattyBot, TomFromNeam, Khazar2, Redalert2fan, FOX 52, ArmbrustBot, Zx1100f1, Monkbot, Lamplighter 342 and Anonymous: 72
- **Sikorsky SH-60 Seahawk** *Source:* [https://en.wikipedia.org/wiki/Sikorsky\\_SH-60\\_Seahawk?oldid=696956899](https://en.wikipedia.org/wiki/Sikorsky_SH-60_Seahawk?oldid=696956899) *Contributors:* The Epopt, Leandro, JohnOwens, Michael Hardy, Tannin, Delirium, Arpingstone, Rlandmann, Alvaro, Bogdangiusca, Rossami, Jiang, Conti, David Newton, SEWilco, Wernher, Thue, RadicalBender, Blainster, Greyengine5, IRelayer, Mark.murphy, Bobblewik, Hammersfan, Neutrality, Karl Dickman, Mtnerd, Trevor MacInnis, Ericg, Night Gyr, Amerika, Rcsheets, Krellis, Pearle, SPUTI, Thatguy96, Jigen III, Interiot, Complex01, Mike Beidler, Evil Monkey, UPH~enwiki, Bobrayner, BD2412, Kbdank71, Miq, Rjwilmsi, Rogerd, Ian Dunster, Eubot, Vegardw, Chinfo, Gurch, Coolhawks88, Victor12, DVdm, Chwyatt, YurikBot, Noctador, Wavelength, Mcneight, Jimp, RussBot,

Arado, Marloth2000, Ve3, Saberwyn, CWenger, Alureiter, Nick-D, SmackBot, Looper5920, Ariedartin, Pretendo, Chris the speller, DocKrin, Dual Freq, Quartermaster, Jumping cheese, Godanov, ThurnerRupert, Analayo, MilborneOne, Timkeck, PRRfan, Mets501, Nevyan17, Bryanwxup, CmdrObot, Mattbr, Wafulz, Orca1 9904, Funnyfarmofdoom, J-boogie, Cydebot, Fnlayson, EMBaldwin, Thijs!bot, Deathbunny, Carloseduardo~enwiki, Hcobb, Signaleer, Hulces, Spartaz, Born2flie, DagosNavy, JAnDbot, Sabulyn~enwiki, A75, BilCat, LorenzoB, Saburny, E2a2j, Sm8900, R'n'B, CommonsDelinker, MarcoLittel, Dividing, NevyanSD, Nigel Ish, VolkovBot, GimmeBot, GroveGuy, Firehat87, Yeokaiwei, Raryel, ANigg, SieBot, VVVBot, Chris826, Cobatfor, Atani, Lightmouse, Weemanorpope, Hamilton-daniel, YSSYguy, MenoBot, Binksternet, Helenabellla, Suradnik13, Marlow10, Alexbot, The Founders Intent, GPS73, DumZiBoT, ApocalypseNow15, Carlbush, Salam32, Mimarx, Nukes4Tots, Dave1185, Addbot, Magus732, Download, Lightbot, Zorrobot, The Bushranger, Legobot, Yobot, WikiDan61, Wikipedian2, Troymacgill, Calhounjim, Skalee, AnomieBOT, Crecy99, Xsoundx, MauritsBot, Nardisoero, Captain Cheeks, Sharky2noy, Mark Renier, Kyteto, Citation bot 1, Elite501st~enwiki, RedBot, Cyganka, Danjw1, Julien1978, Degu93, Bryan TMF, 777sms, Mouath14, RjwilmsiBot, Mztourist, Babak902003, GoingBatty, Sp33dyphil, TeeTylerToe, ZéroBot, Yiosie2356, Baronoz, Tholliday1486, Chesipiero, ClueBot NG, Konstantinos19, ColMilGem, LofarMarc, Jetijonez, Helpful Pixie Bot, Sabre ball, Snow Blizzard, America789, Cyberbot II, None but shining hours, Adnan bogi, YFdyh-bot, Irondome, FOX 52, Ionblast, JacobiJonesJr, Hsm-51, Achmad Fahri, UnbiasedVictory, Dslot424, Sierra-Hawk, Kioan, Nurse2Be, Alhadramy Alkendy, Julietdeltaima, Warren Edge, Burdickkm and Anonymous: 221

- **Penguin (missile)** *Source:* [https://en.wikipedia.org/wiki/Penguin\\_\(missile\)?oldid=686283914](https://en.wikipedia.org/wiki/Penguin_(missile)?oldid=686283914) *Contributors:* Rlandmann, Wernher, Karl Dickman, Ulflarlsen, Rackham, Pearle, Duffman~enwiki, Joshbaumgartner, Gene Nygaard, Miq, FlaBot, Los688, Manxruler, Lao Wai, Sandstein, Jsnx, Deiaemeth, DHN-bot~enwiki, Il palazzo, Tscabot, Joffeloff, Andrws, Cydebot, Nabokov, Aldis90, Nastykermit, Thijs!bot, Woody, Escarbot, E rik, WerWil, Dybdal~enwiki, Arsenikk, .anacondabot, Appraiser, BilCat, E104421, Rettetast, R'n'B, Rei-bot, Synthebot, SieBot, Ipankonin, Da Joe, Troy 07, Tomas e, Sun Creator, Addbot, Lightbot, The Bushranger, Luckas-bot, Yobot, Mahe\$hdeva, Xqbot, Sas1975kr, Jurryaany, WildBot, Livgardisten, Ratmangxa, TeeTylerToe, Illegitimate Barrister, Tioperci, Kees klei-jwegt, Laodah, Cyberbot II, Adnan bogi, Raymond Holmoey, Makecat-bot, Veronicawilson235, Guilherme fin and Anonymous: 43
- **AGM-114 Hellfire** *Source:* [https://en.wikipedia.org/wiki/AGM-114\\_Hellfire?oldid=700753387](https://en.wikipedia.org/wiki/AGM-114_Hellfire?oldid=700753387) *Contributors:* The Epopt, Mav, Bryan Derksen, Infrogmation, Rambot, Rlandmann, Daniel Quinlan, Katana0182, Echoray, Wernher, Oaktree b, David.Monniaux, Riddley, Altenmann, Profoss, DocWatson42, Oberiko, Greyengine5, There is no spoon, Leonard G., Bobblewik, Mustafaa, Mzajac, Michael Rowe, Pettifogger, Cynical, Blue387, Zigmars, Acad Ronin, Mtnerd, N328KF, Rich Farmbrough, Guanabot, StoneColdCrazy, Ivan Bajlo, Night Gyr, WegianWarrior, Bender235, ZeroOne, Loren36, Harald Hansen, Tronno, Cwolfsheep, Thatguy96, Joshbaumgartner, Wtmitchell, TaintedMustard, Bradipus, Wyatts, Drbreznjev, Ahseaton, Bobrayner, Mindmatrix, Trevorparsons, BlaiseFEGan, Wayward, Graeme-Leggett, Dovid, Ashmoo, Demonuk, MatthewDBA, Rjwilmsi, Erebus555, Supersteve1440, Chobot, Ahpook, YurikBot, Arado, Hydrargyrum, Manxruler, Megapixie, TDogg310, 21655, Arthur Rubin, Cassini83, Orcaborealis, Curpsbot-unicodify, Diagraph01~enwiki, Nick-D, Groyolo, SaveTheWhales, SmackBot, Looper5920, Emoscopes, Deon Steyn, Pgk, Fallsend, Lonelymiesarchie, Chris the speller, Jprg1966, Thumperward, Moshe Constantine Hassan Al-Silverburg, The1exile, Htra0497, TheGerm, Quartermaster, OrphanBot, MJCdetroit, A.R., John, MilborneOne, Spartanfox86, Butko, Joffeloff, Micoolio101, Stevebritgimp, Publicus, Lorikeet, Iridescent, Chillin1248, Tufttoon, Cydebot, Fnlayson, Hydratlon31, Msnicki, Nabokov, Aldis90, Thijs!bot, Wikid77, Woody, Carloseduardo~enwiki, Graham-dubya, Miller17CU94, Hcobb, Kaaveh Ahangar~enwiki, Heroeswithmetaphors, BokicaK, Waerloeg, 3R1C, Born2flie, DagosNavy, JAnDbot, Epeefleche, Schon, PhilKnight, .anacondabot, C d h, Puddhe, Arz1969, Alex Spade, BilCat, LorenzoB, E104421, DerHexer, Edward321, TazMage, Raza0007, STBot, CommonsDelinker, Numb03, Clarkcol, KylieTastic, STBotD, DorganBot, Num1dgen, Enryü6473, Tourbillon, Zaher1988, Ng.j, Wiae, Damérung, Nickpullar, Andy Dingley, Falcon8765, Eurocopter, Koalorka, Verox, SieBot, Loudogie, Jerryobject, Redvoler, OKBot, ZH Evers, ClueBot, Mild Bill Hiccup, Scorpene, DragonBot, Ktr101, Wilsone9, The Founders Intent, VsevolodKrolivok, Staygyro, Chaosdruid, DumZiBoT, Grautbakken, Dave1185, Addbot, Some jerk on the Internet, EZ1234, ContiAWB, Hardwarefreak, The Bushranger, Luckas-bot, Yobot, Vendettanjm, Tangopaso, Nallimbot, KamikazeBot, 8ung3st, AnomieBOT, Archon 2488, Asok71, Rubinbot, 1exec1, Materialscientist, GB fan, Simultaneous movement, MauritsBot, Xqbot, Tomdo08, Abce2, Mark Schierbecker, SassoBot, Mastermaiozi, Misortie, FrescoBot, Kyteto, Tavernsenses, Armigo~enwiki, 1976reds, AstaBOTH15, SiPlus, Emenemu, MCQknight, DadOfBeanAndBug, Reaper Eternal, Tumna, Jurryaany, RjwilmsiBot, Ankurbhageria, EmausBot, Babak902003, SingleIntegral, Sp33dyphil, Anirudh Emani, Righteous9000, Gplav, Illegitimate Barrister, Ebrambot, Frostbite36, BP OMowe, Bob drobbs, WarHeroZ, Iron Archer, Ready, NADIN2, ChuispastonBot, Masc80, Cgt, ClueBot NG, Jack Greenmaven, Catlemur, Code16, Doh5678, Blade-of-the-South, Mesoderm, Helpful Pixie Bot, Mbedway, BG19bot, SlimRindy, Kendall-K1, Thai1977, BattyBot, Jafder, America789, Irul 901, عصیانی، Faizan, Aftabbanoori, FISH MAN C, Kbd201214, Fabwiki88, Monkbot, ByronLove12, TredBear, Amortias, Faraz092, Tjdunn1979, GeneralizationsAreBad, FlorentPirot, Green547, Aiden94Joseph, Colbert, Sonymobile, HarryKernow, Darkwand~commonswiki and Anonymous: 253
- **Helicopter deck** *Source:* [https://en.wikipedia.org/wiki/Helicopter\\_deck?oldid=675088239](https://en.wikipedia.org/wiki/Helicopter_deck?oldid=675088239) *Contributors:* Saberwyn, SmackBot, Neddyseagoon, Born2flie, AlexNewArtBot, Ng.j, Maralia, Niceguyedc, Queenmomcat, Lightbot, PMLawrence, MartinHartland, DexDor, ClueBot NG, ChrisGualtieri, Dovetail aviation and Anonymous: 5
- **Beartrap (hauldown device)** *Source:* [https://en.wikipedia.org/wiki/Beartrap\\_\(hauldown\\_device\)?oldid=697963880](https://en.wikipedia.org/wiki/Beartrap_(hauldown_device)?oldid=697963880) *Contributors:* Maury Markowitz, AlainV, DocWatson42, Plasma east, Geo Swan, Alai, Saxifrage, Friedfish, SmackBot, Trekphiler, Wizardman, David Humphreys, Dricherby, George.Hutchinson, Ng.j, Hourick, Shem1805, GoingBatty, H3llBot, CharlieEchoTango and Anonymous: 12
- **OTO Melara 76 mm** *Source:* [https://en.wikipedia.org/wiki/OTO\\_Melara\\_76\\_mm?oldid=700258006](https://en.wikipedia.org/wiki/OTO_Melara_76_mm?oldid=700258006) *Contributors:* Maury Markowitz, Panairjdde~enwiki, Edward, Mcarling, Finlay McWalter, Stephan Schulz, DocWatson42, LHOON, Klemen Kocjancic, Brianhe, Rama, Kaganer, Lectonar, Gene Nygaard, Woohookitty, D.E. Watters, BlaiseFEGan, GraemeLeggett, XLaterate, Kallemax, Kolbasz, Victor12, MoRsE, Bgwhite, Scoo, The Rambling Man, Noclador, Sangwine, Ergbert, Saberwyn, Kkmurray, Joffer, Rosc0, Orcaborealis, Phichanad, Alureiter, Bob Hu, Diegfrieden, SmackBot, Emoscopes, Deon Steyn, Chris the speller, Bluebot, Moshe Constantine Hassan Al-Silverburg, Rebutter, Derekbridges, Derek R Bullamore, Boreas74, Haus, CmdrObot, MarsRover, Cydebot, Evogol, Aldis90, DPdH, Corella, Nlkrio, MassRefuge, Jemenal, BilCat, E104421, Saburny, Jim.henderson, R'n'B, KTo288, Rebell18190, New Hampshirite, KylieTastic, George.Hutchinson, Num1dgen, Davidships, TXiKiBoT, Broadbot, Koalorka, Nitragen, Heb, Brozozo, Dodger67, Stefanomencarelli, Homan05, FerdinandFrog, Alexbot, Socrates2008, Dicc93, Rogercar, Life of Riley, SilvonenBot, Dave1185, Jim Sweeney, Kmoutsatsos, LaaknorBot, Fireaxe888, Lightbot, Luckas-bot, Yobot, Ptbotgourou, AnomieBOT, Octillion88, UnexpectedBanana, Xqbot, Syameer95, Volitanc Carp, Uchuusenkan, Thehelpfulbot, LittleWink, RedBot, Full-date unlinking bot, Dac04, RWFinFW, MFIRELAND, Lotje, Music-ToDieTo, Jackehammont, EmausBot, John of Reading, Touya90, Mc spoilt b'stard, Faceless Enemy, TheKrazyDude, ZéroBot, Digital-Curves, Plinio Cayo Cilesio, Artemide81, KLBot2, Gunnai, Benzband, Xtian06, Katangais, Markanthonyt, ProudIrishAspie, Vitorreid, CeraBot, BattyBot, Cyberbot II, Adnan bogi, Khazar2, ÄDA - DÄP, SteenthIWbot, Jerryntejc, Kistara, TerryAlex, Kowl00n, Longpiragon and Anonymous: 128

- **Phalanx CIWS** *Source:* [https://en.wikipedia.org/wiki/Phalanx\\_CIWS?oldid=698320937](https://en.wikipedia.org/wiki/Phalanx_CIWS?oldid=698320937) *Contributors:* The Epopt, Rmhermen, Edward, Mcarling, Samw, Charles Matthews, David Newton, Jnc, Tempshill, Wernher, Carbuncle, Riddley, ChrisO~enwiki, Chris 73, Moink, Tom harrison, Iceberg3k, Bobblewik, Hammersfan, Mtnerd, Canterbury Tail, Rob cowie, N328KF, Eyrian, Noisy, Rich Farmbrough, Andrew1718, Night Gyr, ZeroOne, Rsmelt, TomStar81, Hooperbloob, Sandstig, Ricky81682, Lord Pistachio, Ferried, Msylvester, Katana, Ravenhull, Gene Nygaard, Axeman89, Falcorian, Richard Arthur Norton (1958- ), Nvinen, RPharazon, Cws125, GregorB, Tsunade, Kar-mosin, Kralizec!, Rufous, Mandarax, Rjwilmsi, Durin, Allynfolksjr, Mark83, AnthonyA7, Jaraalbe, Mmx1, Chwyatt, Ahpook, PainMan, Jak722, RussBot, Fuzzy901, Gaius Cornelius, Mike Young, Lavenderbunny, Rhindle The Red, Daveswagon, ENeville, Mipadi, Czryko, Ricroz, TDogg310, Saberwyn, MakeChooChooGoNow, Kyoukoku, Vhgk3z5b, Knotnic, Bagheera, Sturmovik, Curpsbot-unicodify, Alureiter, Allens, Some guy, Nick-D, Groyolo, That Guy, From That Show!, SmackBot, Radak, Emoscopes, Bjelleklang, The Monster, Cla68, Rmosler2100, Armeria, Chris the speller, Thumperward, BobThePirate, Kostmo, Florian Adler, Dual Freq, Il palazzo, Ogi010, Quarter-master, RFightmaster, Albwus, Lyta79, Jumping cheese, Wybot, Warphammer, Acdx, Zoperd, LWF, IronGargoyle, Like tears in rain, Dave420, Cabez, Octane, Dp462090, Xcentaur, Just a member, CmdrObot, Mleivo, Weng1021, Cydebot, CorpX, DumbBOT, Nabokov, Nottheaking, Papajohnin, Aldis90, Thijs'bot, PerfectStorm, Ros Power, Brianmarx, Ekim, Fru1btat, Solaran X, Ingolfson, DagosNavy, Barek, Royhandy, RoundSparrow, DarrenC, SHCarter, BilCat, Ehowell98, LorenzoB, Warren Dew, Steve98052, Hellopple, New Hampshireite, Trumpet marietta 45750, VoidLurker, Num1dgen, Hpeterswald, RaptorR3d, Hammersoft, Schmidtchen, Jeff G., Occasional Reader, BubbleDine, SpartanPhalanx8588, Kepiblanc, MadJoe75, EX STAB, Billytrousers, Theoneandonlyother, Lightmouse, Latics, MBK004, PipepBot, Auntnof6, Sturm vogel 66, Thewellman, Chaosdruid, SpartanPhalanx, GPS73, LordJesseD, XLinkBot, Wikiuser100, WikHead, MystBot, USS Noob Hunter, Dave1185, Addbot, Toyokuni3, Buckeye6, LinkFA-Bot, Lightbot, Smile4Chomsky, Luckas-bot, Yobot, 19est66, AnomieBOT, Ratsschüler, RadioBroadcast, ArthurBot, Wiretree, J04n, GrouchoBot, Amendola90, MerlLinkBot, Sarcastic ShockwaveLover, Eugene-egato, FrescoBot, Fulcrum27, LucienBOT, Kyteto, Degen Earthfast, BigDwiki, RedBot, FoxBot, J.Rayan, Yanaphop, DubeyNYC, Jurryaany, Beyond My Ken, EmausBot, Babak902003, Super48paul, ZéroBot, Illegitimate Barrister, Josve05a, Victory in Germany, JeffBengtson, CountMacula, WikiCopter, MothProofLemming, Mbcoffin, ClueBot NG, Heaney555z, Titodutta, DBigXray, DeeJaye6, \$oliton, Yowanvista, Ytpete, Glevum, Minsbot, BattyBot, Qrhoo, America789, Cyberbot II, Adnan bogi, Dexbot, Irondome, Munchito696, Redalert2fan, 2ChannelGod, Henry.the.Hamster, Varixai, WPGA2345, SantiLak, GastonL0pe3z, Storebj0rn, Kbj5750 and Anonymous: 280
- **Mark 32 Surface Vessel Torpedo Tubes** *Source:* [https://en.wikipedia.org/wiki/Mark\\_32\\_Surface\\_Vessel\\_Torpedo\\_Tubes?oldid=675086208](https://en.wikipedia.org/wiki/Mark_32_Surface_Vessel_Torpedo_Tubes?oldid=675086208) *Contributors:* Riddley, Kappa, Pol098, Miq, Avocado, Mare, Saberwyn, Alureiter, SmackBot, Dual Freq, Aldis90, Igodard, Kguirnela, Notreallydavid, Signalhead, McPoet, Maralia, Alexbot, Addbot, Crowtox, Zorrobot, AdmiralHood, Panda 51, LucienBOT, RjwilmsiBot, WikitanvirBot, Helpful Pixie Bot, Llammakey and Anonymous: 2
- **Mark 46 torpedo** *Source:* [https://en.wikipedia.org/wiki/Mark\\_46\\_torpedo?oldid=687564204](https://en.wikipedia.org/wiki/Mark_46_torpedo?oldid=687564204) *Contributors:* Rmhermen, Minesweeper, Rlandmann, Riddley, Christopher Parham, Bobblewik, Bbpenn, Rama, Night Gyr, Ommnomnomgulp, Joshbaumgartner, Gene Nygaard, GraemeLeggett, Graham87, Borgx, Los688, Alureiter, SmackBot, M249SAW, Hmains, Julian Diamond, Florian Adler, Dual Freq, Rebutter, Il palazzo, OrphanBot, Wikited, Leebert, Cydebot, Nabokov, Aldis90, Mactin, Corella, Adepitus, Paul1776, BilCat, LorenzoB, Kguirnela, Sylfred1977, Kernel Saunters, Binksternet, Klui1, PipepBot, Matrek, Pekelney, Alexbot, Thewellman, Life of Riley, Dave1185, Addbot, M.nelson, Maskell883, Luckas-bot, Yobot, Oilpanhands, The High Fin Sperm Whale, Xqbot, Chen Guangming, GrouchoBot, FrescoBot, Jurryaany, DexDor, WikitanvirBot, Babak902003, Lukas Tobing, HantsAV, Geecii, RobDuch and Anonymous: 31
- **Mark 50 torpedo** *Source:* [https://en.wikipedia.org/wiki/Mark\\_50\\_torpedo?oldid=677541295](https://en.wikipedia.org/wiki/Mark_50_torpedo?oldid=677541295) *Contributors:* Rmhermen, Rlandmann, Andreawa, Riddley, Christopher Parham, Bobblewik, Bbpenn, Duk, Joshbaumgartner, Wtshymanski, Durin, Kirill Lokshin, Los688, Megapixie, David Biddulph, Alureiter, SmackBot, DHN-bot~enwiki, Dual Freq, Rebutter, Il palazzo, Aerobird, John, Wikited, 5-HT8, Cydebot, Nabokov, Aldis90, HolyT, Demonkey36, STBot, CommonsDelinker, Kguirnela, Raryel, Binksternet, Matrek, Thewellman, Jellyfish dave, USS Noob Hunter, Dave1185, Addbot, Luckas-bot, Yobot, The Original Editor, Jim1138, The High Fin Sperm Whale, AdmiralHood, Xqbot, KevinPerros, FrescoBot, EmausBot, Babak902003, BG19bot, Cyberbot II and Anonymous: 17
- **Mark 13 missile launcher** *Source:* [https://en.wikipedia.org/wiki/Mark\\_13\\_missile\\_launcher?oldid=693047965](https://en.wikipedia.org/wiki/Mark_13_missile_launcher?oldid=693047965) *Contributors:* Rlandmann, Iceberg3k, Avriette, Rama, Mandarax, Deltabeignet, Rjwilmsi, Victor12, Mare, Saberwyn, Nick-D, SmackBot, Looper5920, Chris the speller, Dual Freq, Quartermaster, Accurizer, Cydebot, Aldis90, Two way time, Idioma-bot, PaladinWhite, Binksternet, Dougall1955, MelonBot, Grande101, Addbot, VP-bot, TaBOT-zerem, AdmiralHood, DrilBot, Illegitimate Barrister, BattyBot, Andaarw, Monkbot, Fntts6 and Anonymous: 9
- **RIM-66 Standard** *Source:* [https://en.wikipedia.org/wiki/RIM-66\\_Standard?oldid=701074551](https://en.wikipedia.org/wiki/RIM-66_Standard?oldid=701074551) *Contributors:* Rlandmann, DocWatson42, Rjwilmsi, Bgwhite, WriterHound, Arado, Bleakcomb, Gaius Cornelius, Cerejota, Attilios, SmackBot, Hibernian, Dual Freq, AP1787, CmdrObot, Cydebot, Rifleman 82, Adnierge, Aldis90, DulcetTone, Woody, Nick Number, QuiteUnusual, Sarmadys, JAnDbot, Two way time, BilCat, Jamesontai, VolkovBot, TXiKiBoT, Broadbot, AlleborgoBot, Unregistered.coward, Cobatfor, MBK004, Arjayay, Shem1805, Thewellman, Chaosdruid, DumZiBoT, Addbot, H92Bot, Ginosbot, Lightbot, The Bushranger, Luckas-bot, Yobot, Troymacgill, Apole7, AnomieBOT, Xqbot, Anon423, Ashrf1979, Nokta strigo, FrescoBot, PigFlu Oink, Skyraider1, Jurryaany, DexDor, EmausBot, John of Reading, Clive tooth, Arapad, BrokenAnchorBot, Iron Archer, Krassdaniel, MainFrame, Catlemur, Snotbot, AeroJPRF, Bonafide2004, BG19bot, Phd8511, Myfgsl-2, Tlai1977, Kool777456, America789, Cyberbot II, OriginalAndCreativeUsernameHere, Cerabot~enwiki, Maxx786, Amortias, Llammakey, Blacktiger87, Colbert and Anonymous: 48
- **Harpoon (missile)** *Source:* [https://en.wikipedia.org/wiki/Harpoon\\_\(missile\)?oldid=700932935](https://en.wikipedia.org/wiki/Harpoon_(missile)?oldid=700932935) *Contributors:* The Epopt, Mcarling, Rlandmann, Jeandre du Toit, <sup>212</sup>, Wernher, Thue, Oaktree b, Riddley, Modeha, DocWatson42, Ike~enwiki, Oberiko, Greyengine5, Wronkiew, Bobblewik, Btphelps, Mzajac, Dabarkey, Jimwilliams57, Bbpenn, Karl Dickman, N328KF, Brianhe, Avriette, Rama, Mecanismo, Bender235, Meggar, Sortior, Harald Hansen, Syzygy, Travisyoun, Hooperbloob, Joshbaumgartner, Sligocki, Gene Nygaard, Yousa465, Bobrayner, Kfitzner, Nuno Tavares, Woohookitty, Blackeagle, Pol098, Isnow, BlaiseFEGan, Paxsimius, Graham87, Descendall, BD2412, Rjwilmsi, Erebus555, Orville Eastland, FlaBot, Demarchist, Victor12, Chobot, YurikBot, Mare, StuffOfInterest, Arado, John Smith's, Broken arrow, Gaius Cornelius, Lavenderbunny, ENeville, Mieciu K, BOT-Superzero cool, Chase me ladies, I'm the Cavalry, Phichanad, Curpsbot-unicodify, Warreed, Tirronan, Sardanaphalus, SmackBot, Prodego, Chris the speller, Baumfabrik, Hibernian, Moshe Constantine Hassan Al-Silverburg, Dual Freq, TheGerm, Open-box, Uncleharpoon, John, Beta34, Dave420, Octane, HowardSel-sam, R. E. Mixer, Paulc206, 5-HT8, Spottydog3, Cydebot, Fnlayson, Daniel J. Leivick, Nabokov, Aldis90, Epbr123, Woody, Dark Enigma, Nick Number, VijayPadiyar, Mongredlog, Quintote, RebelRobot, Magioladitis, MajesticX, Bubba hotep, AsgardBot, BilCat, LorenzoB, Volcore, FlieGerFaUstMe262, Bunker by, Rebell18190, Chrthiel, Notreallydavid, Smitty, STBotD, ThePointblank, Rekinser, VolkovBot, Philip Trueman, TXiKiBoT, Darantares, Dormskirk, VNCCC, Raryel, Tom MacPherson, Kermanshahi, AlleborgoBot, Wjl2, SieBot, Heb, 4wajzkd02, WereSpielChequers, BotMultichill, Ravensfire, Kurokishi, Skipzor, Lightmouse, Dodger67, Nejjk, Ken123BOT, MBK004, ClueBot, Masterblooregard, Socrates2008, El bot de la dieta, Jellyfish dave, James.tantalo, DumZiBoT, 11vert11, Dave1185, Addbot,

EZ1234, Nohomers48, AkhtaBot, Scohen93, Lightbot, BoredEngineer, The Bushranger, Luckas-bot, OrgasGirl, Ata Fida Aziz, Kamikaze-Bot, Apole7, AnomieBOT, Anupsadhu, FreeRangeFrog, Xqbot, DSisyphBot, Lostmuskrat, Hj108, ح.می رزاجسینی, Leetkrew, Le Deluge, Knightwind, Mark Renier, Grand-Duc, Pinethicket, Foxhound66, Marcluell, Dinamik-bot, Bryan TMF, 777sms, Jurryaany, Desagwan, RjwilmsiBot, Thatsashwin, EmausBot, TuHan-Bot, Illegitimate Barrister, Arapad, Anir1uph, Prendre la fuite, Status, ChuispastonBot, HandsomeFella, EdoBot, KarlsenBot, ClueBot NG, ColMilGem, Tioperci, Sharkmouth, Helpful Pixie Bot, SojerPL, TMX-Mike, Pine, 113727b, Kendall-K1, Aisteco, BattyBot, America789, Refizul-enwiki, Adnan bogi, SD5bot, Mojss12, Kbog, Wotchit, Evanolvan, 08af9a09, Geeciii, Eric Corbett, Nguyen QuocTrung, UcAndy, Lamzhiliang, Adam Cameron Smith, Usumacinta, Judah fourteen, Junchuann, Llammakey, Nicky mathew and Anonymous: 178

- **M2 Browning** *Source:* [https://en.wikipedia.org/wiki/M2\\_Browning?oldid=700777319](https://en.wikipedia.org/wiki/M2_Browning?oldid=700777319) *Contributors:* Espen, Alex.tan, Rmhermen, Maury Markowitz, Edward, Ahoeirstemeier, Rlandmann, Andrewa, JidGom, PaulinSaudi, JonathanDP81, Massiveego, RadicalBender, Riddley, Moriori, Yuenkitmun, Donreed, DocWatson42, Oberiko, Greyengine5, Tom harrison, MathKnight, Lefty, Bobblewik, Maclyn611, Gleem, Phil1988, Klemen Kocjancic, Brianhe, Rhobite, Rama, Roo72, Fluzwup, WeganWarrior, Bender235, Neko-chan, El C, Kross, Harald Hansen, Tronno, La goutte de pluie, Thatguy96, Alansohn, The RedBurn, Joshbaumgartner, Linnhall, Bukvoed, Ashley Pomeroy, Lightdarkness, Spangineer, Denniss, Hansag, Hohum, Dominic, Gene Nygaard, Kenyon, Tournesol, Nuno Tavares, Kelly Martin, D.E. 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- **M242 Bushmaster** *Source:* [https://en.wikipedia.org/wiki/M242\\_Bushmaster?oldid=701021723](https://en.wikipedia.org/wiki/M242_Bushmaster?oldid=701021723) *Contributors:* Maury Markowitz, L-Bit, DocWatson42, Subsolar, Thatguy96, ReconTanto, Sligocki, Fourthords, Nvinen, Jrkarp, Kralizec!, GraemeLeggett, Wachholder0, XLerate, CiscoVelasquez, Ahpook, YurikBot, Lavenderbunny, Welsh, Kvn8907, Saberwyn, Joer80, Phichanad, GMan552, Limkopi, Hmains, Chris the speller, Tewfik, Ultor Solis, MilesVorkosigan, MilborneOne, Saxbryn, Loren Architzel, Paulc206, Jeremy Silver, Cydebot, Fnlayson, CMarshall, Nabokov, Aldis90, Thijis!bot, Mack2, Ingolfsn, McMonster, Dodo19~enwiki, Flayer, Arz1969, Schumi555, Nono64, New Hampshireite, Notreallydavid, DanMP5, Kiwinanday, BernardZ, Safemariner, TXiKiBoT, Ploxhoi, Capper13, Bahamut0013, MC-Tales, Wilson44691, Atani, Anchor Link Bot, Martarius, BOTarate, ShipFan, Jax 0677, Dave1185, Addbot, Bazook, Luckas-bot, Yobot, Dramamoose, Quebec99, FreeRangeFrog, .45Colt, Gira2be, Marl Schierbecker, Le Deluge, FrescoBot, Puterawann, Alonso de Mendoza, MFIREland, Jurryaany, Oliver Drechsel, Faceless Enemy, L1A1 FAL, ClueBot NG, Sonertje80, Yamum49, Ose\fio, Helpful Pixie Bot, RLI 61, Gunnai, BattyBot, America789, TigerDover, SJ Defender, LazyReader, Cavalryman V31, Thumper1620, HWClifton and Anonymous: 82
- **AN/SPS-49** *Source:* <https://en.wikipedia.org/wiki/AN/SPS-49?oldid=648358972> *Contributors:* Picapica, Mizzou1307, Rjwilmsi, Engineer Bob, John Broughton, Sardanaphalus, Dual Freq, Sct72, Wybot, PRRfan, Cydebot, Aldis90, Thijis!bot, Rwessel, Thunderbird2, Cb77305, Lightmouse, MBK004, Matrek, PixelBot, Sun Creator, ChrisHedgesUK, Life of Riley, Addbot, Lightbot, WikiDreamer Bot, Yobot, Rubinbot, ZéroBot, SPStek, Garamond Lethe and Anonymous: 6
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Moroccan royal decree (17 November 1915)

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Command Shown: N0808

Camera Operator: PH3 YEBBA

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Camera Operator: JO1 LANCASTER

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Command Shown: N0577

Camera Operator: BATH IRON WORKS CORPORATION

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